THE RELATIONSHIP BETWEEN TEACHERS' PREPARATION AND PERCEIVED LEVEL OF TECHNOLOGY USE IN MATHEMATICS WITH MIDDLE SCHOOL AFRICAN AMERICAN MALES

A Dissertation

by

SHERRIE DEE MASON

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

August 2011

Major Subject: Curriculum and Instruction

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ABSTRACT

The Relationship Between Teachers' Preparation and Perceived Level of Technology Use in Mathematics With Middle School African American Males. (August 2011)

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The purpose of this study was to investigate whether African American male students' academic achievement level can be positively impacted by teachers' use of instructional technology. In addition, this study examined teachers' level of preparedness in the use of instructional technology as well as their perceptions regarding their level of use of instructional technology. Finally, this study investigated the relationship between the technological activities and how effective these activities were in teaching mathematics objectives to African American males.

The participants of this study were middle school teachers from six schools in the southwestern portion of the United States. Participants of this study also consisted of the African American male students enrolled in these teachers' classes. The Middle School Students' Mathematics Teacher Survey was developed and administered to a sample of 33 teachers of middle school-aged African American male students.

The results of the study revealed that the level of teachers' preparedness had an influence on the use and implementation of technology use in the classroom. Teachers' preparedness in the use of instructional technology was related to their African American male students' mathematic achievement. Teachers' perceptions of the use of instructional technology was related to their African American male students' mathematics achievement. Results also indicated that teachers' perceptions regarding use of instructional technology were related to their African American male students' mathematics achievement. The level of teachers' preparedness and their perceptions toward the use of instructional technology in the classroom were reliable predictors of their African American male students meeting the standards in mathematics. When analyzing data, inferential statistical techniques were used to determine the differences between observed and expected frequencies.

DEDICATION

This dissertation is dedicated to my parents, Barbara Jean Mason and the late Billy Joe Mason, my brother, Terrance Mason, as well as to my grandfather, Freddie Lee Johnson. I also dedicate this publication to my deceased grandmothers, Mary Alice Johnson, Lela Bowman, Sarah Elizabeth Mason, and to my deceased grandfather, Willie Mason. I would like to thank them for their prayers, encouragement, and unconditional love throughout my life. I know that I am continuously being blessed from prayers that all of you have prayed on my behalf. I know all of you assisted in making this journey possible. Thank you!

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As I look back on the journey to attaining the distinguished Ph.D., I must thank God for giving me the strength to reach the end, as well as the many along the road who offered some words of encouragement, a nagging reminder to keep persevering, an ear to listen, or some much needed guidance. I would like to acknowledge those countless persons, who are too many to name. Thank you all for your support.

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CHAPTER I

INTRODUCTION

Background of the Study

Nationally, statistics on African American males and middle school students are at the level of basic skills (Berry, 2003; Rousseau & Tate, 2003). According to the National Center for Education Statistics (NCES, 2009a), White students at grade 12 scored 30 points higher in mathematics than African American students and 23 points higher than Hispanic students. In 2009, about 49% of 8th graders from high poverty schools performed at or above basic, 13% performed at or above proficient and 1% at advanced in mathematics.

According to the NCES (2009a), only 6% of 8th grade African American students had math achievement scores at or above the proficiency level; 27% performed at the basic level, while the remaining two-thirds failed to reach the basic performance level. By 12th grade, only a scant 3% of African American students met standards for mathematics proficiency (U.S. Department of Education, 2004). In 2007, African American students scored lower than White students in the 8th grade in all subjects areas overall on national assessments according to the U.S. Department of Education. With respect to math performance of African Americans, 89% were still not proficient in Math at grade 8 (U.S. Department of Education, 2007). White students scored on average at least 26 points higher than African American students on a scale of 0-500 (NCES, 2009b).

The style for this dissertation follows that of *The Journal of Educational Research*.

With respect to African American male students, there is an achievement gap in mathematics today in America's schools. Advocates of culturally relevant pedagogy stress the need to ensure that "real world" problems accurately reflect the students' experiences (Muhammad, 2003). Providing students with authentic learning experiences and opportunities to engage in real world problem solving is embedded in the Standards of the National Council of Teachers of Mathematics (NCTM, 2000).

Several sources view standards-based learning as a key to raising the math achievement of African American students (Haycock, 2001; Rousseau & Tate, 2003; Tate, 1994). The NCTM Standards were in the forefront of current education reforms. In particular, the authors draw on two recommendations embedded in the *Professional Standards for Teaching Mathematics* (NCTM, 1991).

First, teachers are advised to reflect on how students' ethnic, racial, gender, and socioeconomic backgrounds influence the way they learn mathematics. Second, teachers are advised to be aware of the relationship between mathematics and culture, the contributions of diverse cultures to the advancement of mathematics, and the interconnection of school mathematics to other subjects and authentic applications. According to Ferguson (1998), teachers expectations, perceptions, and behaviors have a direct influence on the Black-White achievement gap and also found that the effects accumulate from kindergarten to high school.

Analogous to educators who view the NCTM Standards as key to achieving equity in mathematics, Swain and Pearson (2003) state that, "Implementing technology standards can assist in providing access to educational technologies and a curriculum that promotes the diminishing of the Digital Divide" (p. 331). They also extol the importance of professional development, which is also strongly recommended for raising mathematics achievement. Teachers in low-income schools devote roughly three times as much computer time to drill and practice lessons than teachers in affluent schools (Swain & Pearson, 2003). Students most likely to learn computer applications and engage in research through CD-ROMs and the Internet attend schools with the lowest proportions of students receiving free or reduced price lunch.

Of particular relevance to promoting the achievement of diverse learners, to include African American males, Loucks-Horsley (2000) emphasizes that teachers "need to understand how students learn technology, what kinds of experiences facilitate their learning, and what learning environments foster the exploration and openness to new ideas that must accompany learning" (p. 35). Professional development programs based on identified best practices are essential to realizing this aim.

A sizable body of research documents that the efficacy beliefs of teachers are related to their instructional techniques, which in turn, impact student outcomes (Pajares, 2001; Tschannen-Moran, Hoy, & Hoy, 1998). The predominant line of research on teacher efficacy is derived from Bandura's social cognitive theory of self-efficacy (Pajares, 2001; Tschannen-Moran et al., 1998). Bandura (1986) defines perceived self-efficacy as "people's judgments of their capabilities to organize and execute courses of action required to attain designated levels of performance" (p. 391).

Originally conceived from research on practicing teachers, the concept of teacher efficacy has filtered into teacher education programs with the goal of enhancing the confidence of prospective teachers (Pajares, 2001). The most recent application of teacher efficacy is in the context of preservice preparation for technology education (Mayo, Kajs, & Tanguma, 2005; Wang, Ertmer, & Newby, 2004).

Theoretical Perspective

There are several theoretical perspectives that can be used to explain the impact of technological instruction on the math achievement of middle school students. Among these perspectives are Culturally Responsive Pedagogy, Constructivist Theory, Social Cognitive Theory, and Socio-Cultural Learning Theory.

Culturally Responsive Pedagogy

Research have shown that minority students, particularly African American male students have learning styles that are different from other students (Kunjufu, 2005). A large share of the difference in the learning styles of African American males has been found to be created through cultural differences and the students' perceptions of the classroom environment (Ladson-Billings, 2009).

Kunjufu (2005) argued in order to teach African American students, teachers must bring a special teaching philosophy and pedagogy to the classroom which place emphasis on cultural preferences in relation to teaching and learning. This special pedagogy has been given the name, Culturally Responsive Teaching (CRT). Gay (2010) opines that CRT utilizes cultural knowledge prior experience and the performance styles of students from diverse background to fit them with the most efficiency and effective instructional style which enhance their academic performance. There are five major characteristics of CRT according to Gay (2010). They are as follows:

1. It acknowledges the legitimacy of the cultural heritages of different ethnic groups, both as legacies that affect students' dispositions, attitudes, and approaches to learning and as worthy content to be taught in the formal curriculum.
2. It builds bridges of meaningfulness between home and school experiences as well as between academic abstractions and lived socio-cultural realities.
3. It uses a wide variety of instructional strategies that are connected to different learning styles.
4. It teaches students to know and praise their own and each others' cultural heritages.
5. It incorporates multicultural information, resources, and materials in all the subjects and skills routinely taught in schools (p. 29).

Thus, based on the above characteristics and their implementation into the classroom setting, especially in the teaching of mathematics, teachers use technological instruction must incorporate everyday life concepts into teaching, such as economics, employment and consumer habits of various ethnic groups.

Sociocultural Learning Theory

The central theme of the sociocultural theory in the classroom environment is how to get the most from students while challenging them to reach their highest potential. To acquire this goal, sociocultural theorists believed that exposure to various cultures in the classroom environment would enhance the whole child in the learning process, especially African American students (Berry, 2003).

According to Vygotsky (1978), there are three distinct ways which learning is passed along to students. First, a student can simply copy another person (imitative learning). Secondly, a student can recall direction given by the teacher and then implement (instructed learning). Finally, a student within his/her peer group will cooperate with each to learn while working to understand one another. Based on this theory, the teaching of mathematics through technological instruction, teachers must expose their students to a variety of real-life situations involving math where each interaction is a learning experience.

Social Cognitive Theory

The Social Cognitive theory introduced how mathematics might be made meaningful by responding to specific intellectual capabilities of learners. Thus, the influence of this promise of teaching mathematics' structures ensued. In addition, Jerome Bruner, a noted psychologist, supported a spiral curriculum and the idea of discovery (Resnick & Ford, 1981).

The Social Cognitive theory postulated that children become increasingly more sophisticated in their thinking as they become older. This theory purports that, as people grow older, they develop new, more complex cognitive structures. The presence or absence of certain operations defines the stages of development to intellectual maturity. It takes extended practice and experience for new logical structures to develop. Proponents of this theory believed that children developed through different stages. An instructional approach is to attempt to match instruction to children's developmental level. Instead of waiting for students to be ready for instruction, a more positive approach is to give students tasks that present a challenge which has familiar elements in it.

Based on the social cognitive theory, in order for the use of technological instruction by teachers to teach math to African American male students to ensure their academic success, they must be able to simulate real life situations where these students can identify with and how to use math to solve situations. Additionally, teachers must develop classroom environments where African American students have a sense of self-efficacy and the ability to use computer-based application to solve their math problems.

Constructivist Theory

Researchers have encouraged utilizing the constructivist theory when teaching math where students construct their own mathematical knowledge through reasoning or problem solving (Fey et al., 2006; Kim, 2005). Constructivism is based upon the premise in mathematics education that children have a mathematical reality of their own (Steffe & Wiegel, 1992). In other words, for knowledge to be meaningful, students need to construct it themselves (Marlowe & Page, 1998). This theoretical perspective holds that students' learning of subject matter is the product of the interaction between what they are taught and what they bring to any learning situation (Ball, 1996). Steffe and Wiegel further explained that mathematics knowledge is based on coordination of such actions into organized patterns to achieve some goal. Students learn mathematics by actively reorganizing their own experiences in an attempt to resolve their problems (Cobb, Merkel, Wood, & Yackle, 1990). Constructivism influenced all aspects of learning – the teaching, curriculum, learning, assessment and technology.

Constructivism influenced mathematics by individuals constructing mathematical insights and their meaning within an individual's experience. Students' explanations, their inventions, have legitimate epistemological content and are the primary source of investigation. With this understanding of constructivism in mathematics, ideas in mathematics are created and their status is negotiated within a culture of mathematicians, or engineers, or applied mathematicians, statisticians or scientists, and in society as it conducts its activities of commerce, construction, and regulation (Confrey, 1991).

Statement of the Problem

With respect to African American male students, there is an achievement gap in mathematics today in America's schools. Data suggest that many minority students are not receiving instructional practices that are suggested by the National Council Teachers of Mathematics (NCTM). When considering race, ethnicity, and social status, teachers form varying expectations and perceptions of students. According to the U.S. Department of Education (2007), 53% of African American 8th grade students performed below the basic level in mathematics and 36% at the basic level.

In view of the realities of a technology-driven economy, the effective use of technology in the classroom takes on an urgent role in public education. Studies have shown that middle schools are strategic environments for improving the mathematic performance of all students when instructional technology is adequately utilized. Teachers are vehicles for this improvement, therefore, adequate and ongoing professional development must be made available to ensure student academic success. Additional studies are needed to examine the perception of middle school teachers' level of usage of instructional technology to teach class objectives. A report by the U.S. Department of Education amplifies this conclusion. The report also reveals the need to raise the mathematics and science performance of all students, with particular focus on students of color (U.S. Department of Education, 2004).

Purpose of the Study

The purpose of this study was to investigate whether African American male students' academic achievement level can be positively impacted by teachers' use of instructional technology. In addition, this study examined teachers' level of preparedness in the use of instructional technology as well as their perceptions regarding their level of use of technology implementation. Finally, this study investigated the relationship between the technological activities and how effective these activities were in teaching mathematics objectives.

Significance of the Study

A review of the literature revealed minimal research that specifically investigated a relationship between African American male students' math academic performance and teachers' use of instructional technology. The results of this study can be used to provide additional proven research to school administrators that yield significance to the extension of professional development opportunities to classroom teachers in the preparation and use of instructional technology to teach mathematics to African American male students. By doing so, as prior research shows, improvement in teachers' ability and willingness to adapt to addressing varying learning styles in a culturally responsive setting for underserved students will result. Additionally, the study may provide school administrators with a perspective that allows for budget reviews to include integration of technology use with curriculum, purchasing of technological equipment, and technological training for teachers.

Research Questions

The following research questions were formulated and examined in the study:

1. What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?
2. What are the teachers' perceptions of their level of use of instructional technology when teaching math objectives to African American males?
3. What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?
4. What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?
5. What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students in mathematics?
6. What is the relationship between the activities teachers use teaching mathematics objectives and how effective are the activities in teaching mathematics to African American male students?

Definition of Terms/Variables

The following terms/variables were operationally defined for the present study:

Academic Achievement – refers to the number of students in each middle school teacher's class who met the standers on regular math TAKS test in 2009.

African American Student – refers to an individual receiving academic instruction who is an American with African descent.

Basic Computer Operation – refers to the ability to perform minimum tasks on a computer such as opening and closing files, saving work to a specific file, or utilizing a simple software application (i.e., Internet, Microsoft Word).

Computer-Assisted Instruction (CAI) – refers to a type of classroom instruction with emphasis on computer-based application.

Computer Applications – refers to computer software designed to help the user perform a singular or multiple tasks.

Database – refers to a computerized and organized, usually large collection of data.

Email Use – refers to communication between teacher and students by way of the internet for classroom instructional purposes.

Graphic Use – refers to utilizing computer generated images such as diagrams and mathematical curves to assist in classroom instruction.

Information Searching – Investigating or exploring subject matter by utilizing computer and other technological resources.

Internet Correspondence – Communicating via the world wide web with others by way of email, chat rooms, class activities, gaming, video, etc.

Instructional Technology – refers to a type of classroom instruction with emphasis on computer-based application.

Mathematics Scores – refers to the raw scores on the Math section of the TAKS examination.

Middle School Student – refers to an individual who received classroom instruction from a teacher in grades 6 through 8.

Middle School Teacher – refers to an individual who provides classroom instruction to students in grades 6 through 8.

Practice Drills – refers to repetitive practice utilizing a technological resource in order to acquire knowledge or some skill.

Presentation Skills – refers to *t*he ability to show preplanned material utilizing various resources such as computers, audio or video equipment, projectors, etc..

Spreadsheet – refers to a computerized document that is set up to assist the user in organizing information by rows and columns.

Teachers' Level of Preparedness – refers to a middle school teacher's level of expertise in implementing computer-based instruction in math classes.

Teachers' Perceived Level of Instructional Technology – refers to a middle school teacher's mental disposition regarding their current level of technology use.

Teacher's Perception – refers to a middle school teacher's mental disposition toward the use of instructional technology in the classroom.

Urban School District – refers to an educational enterprise which oversees the academic instruction of students from 1st through 12th grade in an large Metropolitan Area.

Web Browser – refers to a software program that allows the user to access and view the internet.

Word Processing – refers to the use of computer systems in order create documents.

Assumptions

The following assumptions were made regarding this study:

1. The perceptions of middle school teachers, who teach math to a large extent, represented the perceptions of other math teachers regarding the influence of instructional technology on the academic performance of African American students in math.
2. The data from the surveys were deemed accurate and reliable (Kerlinger, 2002).

Limitations of the Study

The following limitations were observed in the present study:

1. Middle school mathematics teachers employed at one Urban School District in the southern region of Texas participated in the study.
2. The math scores of only African American male students who met the standards on the regular math TAKS examination in 2009 were used.
3. Generalizations drawn from the findings of this study were be limited to African American male students attending middle school in an urban school district.

Organization of the Study

This descriptive survey study is organized into five chapters: Chapter I includes the introduction to the study, statement of the problem, purpose of the study, significance of the study, hypotheses, assumptions, limitations of the study, and the definition of terms and variables. Chapter II contains the literature related to the study. Chapter III addresses the methodological framework of the study. It also addresses the population, sampling procedures, instrumentation, validity, and reliability of the instrument, data collecting procedures, and statistical analysis. Chapter IV includes the analysis of data, demographic profile of the dropouts in this study, and frequency distribution tables by predictor, examination of the study, descriptive summary measure, correlation analysis, and the examination and summary of the hypotheses. Chapter V contains the summary, findings, discussions, conclusions, and recommendations of the study.

CHAPTER II

REVIEW OF THE LITERATURE

Introduction

The rampant education reforms of the past two decades support the assertion that, "Empowering all students for learning and living in the 21st century has been a goal for stakeholders in the educational process for many years" (Swain & Pearson, 2003, p. 326). Focusing on eroding the Digital Divide, Pearson and Swain view educational technology as a powerful mechanism for enabling all students to reach higher levels of academic achievement. Technology is considered to be a significant instructional tool by educators that can be very effective in secondary math classrooms (Association of Mathematics Teacher Educators [AMTE], 2007). The idea that technology is a catalyst for transforming learning has been expressed by educators since the inception of Apple Classrooms of Tomorrow (ACOT) two decades ago (Dwyer, 1994; Dwyer, Ringstaff, & Sandholtz, 1991).

Even before the first ACOT classroom opened its doors, former Civil Rights activist and mathematics educator Robert P. Moses recognized that the computer was the instrument of the future. According to Moses (as cited in Checkley, 2001), "It became clear to me that there would be an enormous shift in how we use technology. Instead of using these tools to help us mechanize physical work, we would use them to help use organize mental thoughts" (p. 6). Teacher educators have realized there is a need for technological training in their preservice years; however, research reveals that there are college of education programs that are poorly prepared to deliver the training (Fleming, Motamedi, & May, 2007). Like Cuban (2001), Moses understood that capitalizing on technology would entail a radical transformation of the traditional classroom. It would also involve a new form of literacy.

To Moses, the bottom line in math literacy is mastering algebra, the “gatekeeper” to advanced mathematics courses (Checkley, 2001). As founder of the Algebra Project, which emanated from his work at Martin Luther King High School in Cambridge, Massachusetts, Moses views algebra in terms of two principles: equity and technology. In his experience, he found that African American students often lacked opportunities to enroll in algebra courses, and consequently, in more advanced mathematics courses.

Whereas historically, knowing how to read was essential to full citizenship, numeracy, or *math literacy*, is essential for success in the networked economy (Checkley, 2001). Moody (2000) uses the term *mathematical power* to denote access to courses that engage students in purposeful problem solving activities and prepare them for educational and occupational success.

Equity and Mathematics Reform in Middle School

The results of the Third International Mathematics and Science Study (TIMSS, 2003) generated resurgence in mathematics reform when it was reported that the math performance of U.S. students declines drastically after 4th grade. By 8th grade, U.S. students are far surpassed by students in other countries; their performance drops even further by 12th grade (Le Tendre & Chabran, 1998). The study attributed the sharp decline in U.S. performance to two factors: “our expectations and our curriculum” (p.

308). Le Tendre and Chabran (1998) observed that while middle grade (5-8) students in other countries

> are learning algebra, geometry, probability and estimation, and using the basic skills of addition, subtraction, multiplication and division to solve complex, multistep problems, U.S. students are still stuck in arithmetic, moving onto algebra and other topics only in the 8th or 9th grades if they do so at all. (p. 308)

According to NAEP data, the math scores for urban inner city school districts fall below the national average (NCES, 2006). The districts surveyed are uneven in making progress and most progress is at the basic level. This pattern of achievement can be said to reflect the pattern of course-taking; students who take the complete sequence of college preparatory math courses score much higher on NAEP than students who take no more than one or two courses (Haycock, 2001).

In a study completed by the Council of Great City Schools (CGCS, 2011), it was revealed that 10% of African American (AA) 8th graders scored at or above proficient in large cities (LC) (cities with over 250,000 students) overall, in math which was significantly lower than the percentage of AA 8th graders in national public (NP) Schools at 12%. Also, 13% of AA 8th graders in LC, which include students in the southwestern portion of the U.S., scored at or above proficient. This was not significantly different from the percentage (12%) of AA 8th graders in NP schools who scored the same.

The results of TIMSS 2003 are more promising for U.S. 8th graders, who have improved their standing in both science and math since TIMSS 1995 (Ezarik, 2005). TIMSS (2003) also showed a narrowing of the achievement gap between White and Black students in both subject areas. Cathy Seeley, president of the NCTM, sees the results as favorable but acknowledges that equity is still far off. Seeley (as cited in

Ezarik, 2005) observes that, “We still have way too strong a relationship between wealth and achievement in this country. In our urban and rural schools in particular, we offer them fewer rigorous opportunities to do challenging mathematics” (p. 72).

Another challenge for high poverty middle schools is teacher attrition. According to Strizek, Pittsonberger, Riordan, Lyter, and Orlofsky (2006), 34.7% of urban schools experience difficulty with filling vacancies for middle school math teachers. According to Luekens, Lyter, and Fox (2004), teachers, especially math teachers, are more likely to leave larger urban schools with a more diverse population than rural schools.

Seeley believes that federal, state, and local funding support for improving learning for teachers and students alike will take more schools to higher degrees of achievement. In this context, Le Tendre and Chabran (1998) cite the success of schools and districts that have applied Title I funds toward technology to enrich the mathematics curriculum in elementary, middle, and high school grades.

Mathematic Achievement Among African Americans

The Algebra Project began informally with four students, the first Martin Luther King students to take—and pass—the statewide algebra test for 8th grade students. These students went on to geometry courses and subsequently gained access to honors math courses in high school that raised their chances of college acceptance and offered the prospect of pursuing a career in mathematics or science.

In a study completed by Le Tendre and Chabran (1998), the focus was on mathematics programs in Title I schools. There is clear evidence in the literature that students attending Title I schools are least likely to have access to advanced level math courses. Specifically, they observed that while middle grade (5-8) students in other countries were being taught higher level math courses such as geometry, probability and statistics, U.S. students were still learning arithmetic and moving on to algebra and other topics only in the 8^{th} or 9^{th} grade. Haycock (2001) emphasizes that standards will make minimal difference if they are not aligned with a rigorous curriculum.

Gay (2002) applauds the Algebra Project for showing how students denied opportunities for advancement in traditional classrooms can succeed in rigorous and challenging courses. Gay points out that the educational quality and attainment of some students in an impoverished Mississippi Delta school district were so low that other districts might have referred them for special education. Instead, they thrived in the Algebra Project courses; nearly all the students attained grades that enabled them to elect advanced courses such as geometry and trigonometry when they progressed to high school.

Moses maintains that many African American students receive a severely inadequate or “sharecropper” education, a result of low expectations that children often internalize (Checkley, 2001). Moody (2000) implicates tracking as a major obstruction to African American students’ advancement in math. With tracking, students within the same school are assigned to general or advanced mathematics courses; poor and underserved students are disproportionately represented in general, basic skills tracks. Schools with predominately African American enrollments often do not offer rigorous or advanced math courses (Checkley, 2001; Ezarik, 2005; Thompson & Lewis, 2005).

In one noteworthy example, a determined African American youth (who had reached the highest level of honors courses his school offered) petitioned his principal to have a Pre-Calculus/Calculus course at his high school (Thompson & Lewis, 2005). Moses and similarly dedicated teachers have led other students in securing high level math courses. While these cases illustrate that many African American students have high aspirations for math success, they also highlight the barriers they often confront in realizing them. Some authors have commented that the failures of African American males receive intense scrutiny while their successes gain far less attention (Hunter, 1999; Thompson & Lewis, 2005).

Ironically, reports of a narrowing of the achievement gap inadvertently reinforce limited expectations for the math achievement of students of color. On average, the math skills of African American 12th graders are comparable to those of 8th grade White students (Haycock, 2001). Stated succinctly, “Despite the much talked about changes in mathematics education, African American students continue to perform poorly in school mathematics” (Ladson-Billings, 1997, p. 697). African American males are at particular risk for low achievement (Berry, 2003, 2005; Hunter, 1999; Osborne, 1999; Rousseau & Tate, 2003; Tate, 1994; Thompson & Lewis, 2005).

Ladson-Billings (1997) notes that there are several theories on the poor mathematics performance of African American students. Some sources argue that there is a “discontinuity” that occurs “between students’ home language and the perceived ‘precision’ of mathematics and mathematical language” (Ladson-Billings, 1997, p. 697). Proponents of this theory emphasize that the discontinuity or disconnect is strongest for low-income Black students who live in communities isolated from mainstream White culture (Allen & Boykin, 1992).

An alternate albeit related explanation is that, “the content of school mathematics is so divorced from students’ everyday experience that it appears irrelevant” (Ladson-Billings, 1997, p. 697). Moses agrees that the formal language of mathematics makes it appear inaccessible, as well as with the idea that traditional math instruction reinforces the belief that mathematics is an abstract construction with minimal relevance to students’ lives (Checkley, 2001). Thus the Algebra Project is grounded in experiential, authentic learning. Navigating the transition from didactic instruction to constructivist pedagogy is difficult for many teachers and seems to pose a particular challenge for math educators (Ball, 1996). The TIMSS 1999 Video Study documented that most middle grade math instruction is still teacher-centered with few indications of the problem-solving, inquiry-oriented pedagogy that promotes deep understanding and is linked with high achievement in other countries (Hiebert & Stigler, 2000; TIMSS, 2003). Similarly, Moses argues that the solution does not lie in bussing, magnets, or charter schools, but in improving the quality of teaching from elementary school upwards (Checkley, 2001).

Paradoxically, students with the most powerful need for excellent teaching are most likely to experience it. Students in low-income schools are most likely to be in classrooms with teachers who lack qualifications in the subject or discipline they teach (Haycock, 2001). The problem is most pronounced in the math and science classrooms of high schools with predominately minority enrollment.

African American male students are faced with the double jeopardy of being underachievers in a society where the majority of students of *all* ethnic groups fail to reach mathematics proficiency. More than 20 years after *A Nation at Risk* drove the first wave of education reforms, the U.S. Department of Education (2004) was forced to concede that, “Few students have competence in science or mathematics” (p. 15). The Department of Education researchers believe that enhanced technology education, in the context of NCLB, has the potential to reverse the detrimental pattern of sub-par performance for students across sociodemographic groups.

Factoring in the African American Male

An Immediate Need to Intervene

At any given moment, one may open their local newspaper or turn on their television to their local or national news station and hear and or read about some captive negative state of an African American male’s life. While the plight of the African American male is no secret, there seems to be no end to the negativity surrounding them in sight. Further, there seems to be no massive or immediate plan to bring about a radical and effective change.

Contributors to this state of crisis that surround the African American male include unemployment, incarceration, and educational attainment. According to the National Urban League (2007), African American males are seven times more likely than White men to be incarcerated and African American males between the ages of 15 and 19 die from homicide. The report also revealed that African American males tend to earn only 75% of what White men earn in comparable jobs. Further, they are more than twice as likely to be unemployed than White males.

Johnson (2006) explains that there is much educational literature that portrays African American men as unintelligent, and among other things, sexual predators and drug addicts. We respond to African American men according to the way we think of them. This may contribute to teachers over looking African American male students' intellectual qualities. There are also unreliable and subjective procedures such as teacher referrals and testing that have been linked with the issue of an overrepresentation of African American males in special education services (Bradley, Johnson, & Plunkett, 2006).

Academic achievement among African American males is yet another immediate contributor of the current state of this group of society. As noted by Lewis (2010), in order for African American males to overcome some of the many negative issues they are facing, it is critical that they achieve educational success. Prior research has described the academic achievement of African American males in terms of failure (Thompson & Lewis, 2005). They are more likely to attend predominately African American high schools where most students enrolled receive free or reduced lunch (White, 2009). Further, African American males are underrepresented in advanced and honors courses, tend to be placed in special education more often, and finally, are more likely to be suspended or expelled from school (Garbarino, 1999; Strayhorn, 2008).

The role of the teacher is highly important in students' academic success (Carter, 2000). African American males are affected by negative perceptions about them and may incur elevated levels of stress in school (Kunjufu, 2001; Strayhorn, 2008). In Chambers' (2009), study of the receivement gap, it was found that high school African American students' academic achievement in math could be positively or negatively influenced by differential treatment incurred from school personnel as early on as elementary school. Teachers in urban schools have stated that by maintaining high expectations for all students, regardless of their economic situation, is significant (Diffily & Perkins, 2002). Not all students will benefit from having high quality teachers, whom exhibit characteristics of commitment to students and learning, a strong knowledge base of subject matter and how to teach it, as well as have a responsibility for student learning (Hopkins, 2004). Students who have several ineffective teachers in a row are likely to incur lower achievement as well as achievement gains than those who had highly effective teachers consecutively (Sanders & Rivers, 1996). African American students are more likely to have the most ineffective teachers and African American males are more likely to attend high schools that employ a large number of teachers who teach subjects of which they did not receive a degree for and or who are on provisional licenses (Strayhorn, 2008).

Other factors can lead to the rise or fall of African American male's academic achievement level. According to Mandara (2006), African American parents who are actively involved in their sons' schoolwork, limited certain activities such as video games, radio, and television, and insured regular and positive communication with teachers and school officials, increased odds of positive academic achievement for their son. Barriers that hinder parental involvement such as mistrust between parents and school staff may exist. Further, there could be issues such as work schedules or lack of transportation that hinder involvement in school (White, 2009).

Whereas African American males are at or near the bottom of every academic scale as it relates to academic achievement, there are things that can be done to raise the scales. In order for African American males to overcome their problems, they must obtain an education (Erskine & Lewis, 2008). African American students tend to perform at a higher level when classroom instructional strategies related to culturally responsive activities are incorporated by teachers. These activities include cooperative learning and the use of technology (Howard, 2001; Wilson-Jones & Caston, 2004). Teachers of diverse learners, including African American males must be highly qualified and must be trained to identify and meet their unique needs. Learning styles and cultural backgrounds must be taken into consideration. Further, educational leaders must provide the professional development and other necessary resources to assist in addressing the academic needs of African American males.

Instructional Technology

Background and Current Trends

Computer-assisted instruction (CAI) has been used since the 1970s, typically as a supplement to conventional classroom instruction (Cuban, 2001). The pioneer project in going beyond CAI to teach with technology is Apple Classrooms of Tomorrow, which began in 1985 as a collaborative research and development effort involving public schools, universities, research organizations, and Apple Computer (Dwyer et al., 1991). The original goal of the project was to explore the impact of technology immersion on teaching and learning. The innovative ACOT classrooms with teaching immersed in technology were designed to serve as "living laboratories," a metaphor that invokes Dewey's vision of classrooms as laboratories for democracy. As the project evolved, the researchers discerned a pattern of teaching with technology they labeled *Entry, Adoption, Adaptation, Appropriation,* and *Invention.*

The *entry* phase began with the first cohort of teachers who generally had minimal experience computers (Dwyer et al., 1991). As novice teachers, they had to master the dual tasks of learning new technologies and managing routine classroom situations. In the *Adoption* stage, the teachers began working with the computers, although they still used them as an adjunct to traditional classroom instruction. There was no significant impact on grades. Yet despite the superficial technology use, the students' showed enhanced self-esteem and motivation. Teachers reported few absences and discipline problems. During *adaptation*, the students began working with word processing, databases, CAI applications, and a few graphic programs as part of their daily classroom activities. Their behavior was clearly more productive and self-directed, although the classroom was still dominated by teacher-centered instruction. *Appropriation* was achieved by teachers' self-mastery of the technology. This phase marked the transition to new strategies such as team-teaching, interdisciplinary collaboration, project-based learning, and individualized instruction. The students' mastery of technology paralleled the teachers', thereby allowing them to progress on their own. When *Invention* occurred, it was precisely what the term implies. The teachers were ready to capitalize on their knowledge base and technology expertise and map a new direction for professional development and teaching innovations.

The ACOT researchers concluded that there are two essential conditions for real education reform (Dwyer et al., 1991). First, teachers must be given opportunities to reflect on their beliefs about teaching and learning as a foundation for exploring alternative pedagogies. Second, administrators must be willing to restructure the learning environment to promote teachers' professional development. The same perspective has been expressed in the context of teachers' professional development in general (Darling-Hammond, 1998), and in mathematics, in particular (Ball, 1996; Hiebert & Stigler, 2000). The ACOT researchers also emphasized that change is evolutionary, not revolutionary; the process of technology integration is incremental and requires ongoing support (Dwyer et al., 1991).

An interesting admission is that the ACOT educators initially viewed technology as a medium for enhancing knowledge transmission through writing and drill and practice (Dwyer, 1994). This limited vision was transformed as the teachers began to realize the catalyst for change with which they were working. Teachers departed from their traditional role as classroom authorities and began to assume roles as mentors, coaches, and guides. The most productive classrooms were hotbeds of dynamic interaction and innovation. Assessment practices are notoriously recalcitrant (Ball, 1996). However, as they observed their students' progress, the ACOT teachers assessed their work for evidence of deep understanding (Dwyer, 1994). The students' grasp of subject matter was achieved by the joint exploration of teachers and students into more creative uses of technology. The researchers observed that technology:

1. Facilitates new forms of interactions among students and between students and teachers.
2. Routinely engages students in higher order cognitive tasks.
3. Stimulates teachers to challenge traditional assumptions about instruction and learning (Dwyer, 1994).

It is ironic that 20 years after the first Apple classrooms, and with far more advanced technology, many teachers still see computers as little more than an instructional add-on. This phenomenon is more common in schools serving poor and minority students. While White and African American students have equal access to classroom technology, teachers of African American students more often used computers for drill and practice or games while teachers of White students use computers to promote conceptual knowledge through simulations, demonstrations, or applications (Berry, 2003).

A report issued by the U.S. Department of Education (2004) extols the “vast possibilities of the digital age for changing how we learn, how we teach, and how the various segments of our educational system fit together” (p. 9). The ultimate goal is exploiting network technology is realizing a vision of education reform “unparalleled in our nation’s history” (U.S. Department of Education, 2004, p. 9). However, the authors acknowledge that the promise of technology in education remains unfulfilled. Larry Cuban, a sharp critic of how educators have historically failed to capitalize on new technologies, observes that, “Reformers have been astonishingly successful in wiring schools and equipping them like computer stations” (Cuban, 2001, p. 17). Both Cuban and the Department of Education agree that schools’ acquisition of sophisticated technology has not been matched by an infrastructure to support its full utilization.

Cuban (2001) and his colleagues found that even in technologically savvy Silicon Valley, teachers who used computers extensively at home rarely integrated technology into their classroom lessons. Most students who are adept with computers gain their experience at home rather than at school (Cuban, 2001; U.S. Department of Education, 2004). The Department of Education study confirmed numerous anecdotal reports that students often surpass their teachers in technological sophistication. Students as young as third grade outspokenly expressed ideas about how they thought teachers should use technology to provide them with motivating and enriching learning experiences.

Instructional Technology and Academic Achievement

On the positive side, the Department of Education (2004) reported that states, school districts, and schools are actively involved in allocating resources to align technology with instructional improvements. More negatively, the study confirmed that inadequate training and insufficient understanding of the full potential of technology to enrich learning continue to pose obstacles to technology infusion.

The overall findings suggest that it is easier to remove structural barriers to technology utilization than to change teachers’ pedagogical beliefs and instructional practices. The gap between rhetoric and practice in the application of the NCTM

Standards attests to the ubiquity of this phenomenon in American education (Hiebert & Stigler, 2000).

The primary role of the department of education is to lead. It develops the educational policies and reforms that lead to the improvement of the educational system. The educational reform of No Child Left Behind stated that education should be enhanced through the use of technology. One of its goals was to ensure that students become literate by the 8th grade. The current educational reform known as Race to the Top is setting rigorous educational standards that promote technology as an innovative way to assist in the remediation of the school system. Keeping these in mind, one knows that it is essential to promote research on technology and academic achievement. Computers are used in very different areas ranging from handwriting lesson to language development, from social sciences to science courses, from mathematics to preparing the students for life in education (Kara & Yakar, 2008).

Schwier (1995) stated that there needs to be a combination of behaviorism, cognitivism, and constructivism in education. Computer-assisted instruction is an example of this combination. It can modify and accommodate instructional needs. Additionally, incorporating the use of computers to assist with instruction can modify and increase the rigor of the curriculum being taught.

According to Malone (1986), computer-assisted-instruction has the ability to increase motivation in learners. CAI provides a context that fosters and increases challenges to learners, relevance, as well as stimulates curiosity. The combination of these factors increases the learners' chances of becoming a lifelong learner (Traynor, 2003).

Judge (2005) examined the relationship between the educational growth of young African American learners' and computer access. There were 1,601 kindergarten and 1st grader students that were currently enrolled in public school. It was revealed that the use of a home computer, computer centers in classrooms, and software, were positively correlated with academic achievement. A positive correlation between software used for literacy, math, and academic achievement during kindergarten was discovered. First grade high achievers were found to use software for literacy and math more than low and average achievers during kindergarten.

A report by Sivin-Kachala (1998) in which he reviewed 219 research studies from 1990 to 1997 assessed the effect of technology on achievement which spanned all ages of learners as well as learning domains. He reported consistent patterns once he analyzed the studies that included the fact that students who are exposed to environments that are technology rich tend to experience positive academic achievement levels in all subject areas. He also reported that student's own self concepts improved when computers were utilized for instruction.

Wenglinsky (1998) conducted a study that assessed the effects of simulation and higher order thinking technologies. He utilized a national sample of 4th 6,227 4th graders and 7,146 8th graders math achievement on the NAEP. His findings concluded that 8th grade students who used simulation and higher order thinking software showed a rise in math scores of up to 15 weeks above grade level as measured by NAEP. It was also revealed that higher order uses of computers and professional development had a positive relationship on students' math academic achievement for both 4th grade and 8th grade students.

In a study conducted by Middleton and Murray (1999), teachers' perceptions of their levels of use of technology and its impact on math and reading academic achievement were measured. The findings concluded that math and reading academic achievement were significantly impacted by the teacher's use of instructional technology. Similarly, Kulik (1994) conducted a meta-analysis study that enabled aggregated findings from over 500 research studies of computer-based instruction. It was found that students who used computer-based instruction, scored at the 64th percentile on achievement tests, unlike students in the control conditions without computers who scored at the 50th percentile.

Traynor (2003) researched the Corner Stone computer-assisted program. Seventh and 8th grade middle school students were monitored as they progressed through computer-assisted instruction in a sequential order. The teachers assumed the role of facilitator twice a week. Each student received instruction in the area of language arts, math, reading comprehension and reading vocabulary. After comparing the pretest and posttest scores using the computer-assisted instruction program, it was revealed that special education students did not progress as much as the regular education students.

Further, Traynor (2003), studied computer-assisted instruction as it related to special education, English language learners, students with limited English proficiency, and regular education students. The research revealed that there was a significant difference in the pretest and posttest gains of special education and regular education students, Fl, 156, 0.95, = 15.59, $p < 0.0001$. The results show no other significant differences among the other possible combination of pairs of program types in which students were placed.

Students with disabilities must meet many testing demands, given the current emphasis on accountability and state competency testing. The purpose of this project was to develop and field test a computerized program to teach the Test-Taking Strategy (Hughes & Schumaker, 1991) to secondary-level students with disabilities. The original instruction for the Test-Taking Strategy, validated by Hughes and Schumaker (1991), was transformed into a computerized format based on input from students, teachers, design experts, and technical consultants. A quasi-experimental design utilizing intact classes of students with learning disabilities at both the junior-high and high-school levels was employed to determine the effects of the program. Results showed the computerized program was effective in teaching students to use the Test-Taking Strategy. Statistical differences were found between the posttests of the two groups related to their knowledge of the Test-Taking Strategy, use of the strategy steps on tests, and ability to think aloud about their use of the strategy in a test-taking situation. No differences were found between gains made by junior- and senior-high students in the experimental groups. Further research is warranted to determine if this medium is effective for teaching students other types of strategies (Hughes & Schumaker, 1991).

One must take into consideration the fact that special education students have an identified learning disability with a tendency to learn at a slower rate, if not given an appropriate intervention, this group was predicted to have significantly lower pretest to posttest gains than other groups (Traynor, 2003). Hence, it most likely would take a longer period of exposure to the treatment to see the same results.

According to Irish (2002), computer-assisted instruction could be a feasible alternative for providing strategy instruction that relates to acquisition. It may also assist in the storage and retrieval of basic multiplication facts. Specifically, the data would support the use of CAI in resource classrooms to enhance student performance in basic multiplication facts.

Hitchcock and Noonan (2000) stated that CAI was more effective than traditional instruction for a wide range of skills in math, science, art, reading, and writing. It was proven to be effective on the preschool, elementary, and secondary grade levels. Further, the National Council of Teachers of Mathematics (2000) stated that technology is an essential component of effective math instruction. It can provide a different mathematical perspective. Computer-assisted instruction allows students to process mathematical operations in a different format. It allows mathematical instruction to become personalized. The individualization promotes academic growth.

Irish (2002) also discovered that the use of computer-assisted instruction fostered academic gains in multiplication in a relatively short period of time. The improvements were long term and continued after the experimental period. Hence, the strategy may improve long-term memory. It also may prove to increase the relevance of learning. CAI also continued to improve during the maintenance and follow-up periods. The program appeared to offer an acceptable addition to the array of strategies required by teachers to provide access for their students with disabilities to the regular curriculum.

One must consider the fact that research on computer-assisted instruction (CAI) has minimized the importance of the teachers' influence. Moore (1988) investigated the effects of math instruction (with and without CAI). It also examined the influence of teachers' personalities through ratings of either positive or negative. The posttest results revealed that students who had positive teachers were significantly different from those in negative classes. Students who received CAI showed more improvement than those who did not, but to a lesser degree. The most effective combination is a positive teacher who uses CAI. As there were no interactive effects, the results indicate that the personality of the teacher is a major influence on student achievement, regardless of the method of instruction. Also there was a minimum of correlations between teachers' mathematical knowledge and critical aspects of instructional decision making. Curriculum and other learning resources (e.g., technology, student-student interactions) are clearly important factors for student learning in addition to, and in interaction with, teachers' mathematical knowledge.

The research results suggest that mathematics knowledge for teaching may have a nonlinear relationship with student learning, that those effects may be heavily mediated by other instructional factors, and that short-term content knowledge gains in teacher workshops may not persist in classroom instruction.

Raising Achievement Through Standards

Standards for Diverse Learners

The Multicultural Education Consensus Panel positions culturally sensitive professional development as the first *essential principle* for improving education policy and practice related to diversity (Banks et al., 2001). The 12 essential principles delineated by the Panel are arranged into five categories encompassing: (a) teacher learning; (b) student learning; (c) intergroup relations; (d) school governance, organization, and equity; and (e) assessment. These categories are intertwined in the quest to improve academic achievement for diverse groups of learners.

In the context of mathematics teaching, cultural sensitivity has a unique characteristic. Traditionally, mathematics has been perceived as “neutral and objective” (Tate, 1994, p. 479). However, Tate contends this is based on the fallacious assumption that all students enter the classroom with similar knowledge and experience. Tate uses the example of an urban middle school where a district test asked students whether paying a daily fare or buying a weekly pass was a better deal. The test was designed with the assumption that the commuter would be going to and from a daily job five days a week. A sizable proportion of African American students chose the weekly pass as the better deal. It was the test developers, not the students, who had an erroneous grasp of the problem. When queried about their answers, the students related that family members would be using the passes on weekends as well as weekdays; furthermore, many came from families where adults held more than one job. Tate maintains that this type of discrepancy is what makes many African American students view math as irrelevant. The problems devised by Moses and the Algebra Project teachers are deliberately grounded in the students' daily experience (Checkley, 2001).

The cultural sensitivity explicit in the standards is requisite but not sufficient for achieving equity. Instructional quality means that teachers are adept in a variety of teaching styles and techniques they can call on to match the learning style preferences of their students. A large body of evidence documents that matching instruction to students' learning styles raises academic achievement, particularly for minority and economically disadvantaged students (Burke & Dunn, 2002; Klavas, 1994; Lovelace, 2005; Shaughnessy, 1998).

Haycock's (2001) recommendations for achieving equity in math education are implicit in the Teaching Principle of the *Principles and Standards.* The Teaching Principle outlines three fundamental principles for effective teaching:

- Effective teaching requires teaching and understanding mathematics, students as learners, and pedagogical strategies.
- Effective teaching requires a challenging and supportive classroom learning environment.
- Effective teaching requires continually seeking improvement (NCTM, 2000, pp. 17-19).

While advocating in favor of a culturally responsive pedagogy, Berry (2003) cautions against making stereotypical assumptions under the pretext of being cultural sensitive. Prudently applied, knowledge of African American "cultural style" offers educators a means for tapping into their students' thoughts, feelings, and actions. At the same time, it is essential to recognize that, "Although African Americans share common cultural, historical, and social experiences, not all cultural characteristics uniformly apply to all African Americans" (Berry, 2003, p. 246).

Berry (2003) views the flexibility of the NCTM Standards as an excellent framework for accommodating students' individual learning style preferences. As a reference for African American cultural style, Berry draws on the work of Boykin and colleagues. Two defining characteristics of African American cultural style are *communalism* and *verve*: Communalism reflects a "cooperative and affiliative orientation," a contrast to the *individualism* of mainstream American culture and *Verve* denotes a "special receptiveness to high levels of intense and variable stimulation" (Sankofa, Hurley, Allen, & Boykin, 2005, p. 250). The Standards have provisions for experiential hands-on learning, communication and interaction, and the application of a variety of problem-solving approaches that are congruent with these attributes and with the holistic cognitive style that African American students often display (Berry, 2003).

Berry (2003) offers evidence that schools where mathematics lessons are aligned with the NCTM Process Standards have successfully raised the math achievement of African American students. In Philadelphia, with a predominately Black public school population, a five-year study demonstrated the superiority of the standards-based Interactive Mathematics Curriculum over a traditional curriculum. Students learning through the standards-based program consistently outperformed students in classes with the non-standards-based curriculum. In Pittsburgh, all schools are striving toward the adoption of a standards-based math curriculum. Both Black and White students in schools with high levels of curriculum implementation demonstrate stronger math performance than those in schools in lower stages of implementation.

Wenglinsky (2004) presented an analysis of data drawn from 15,694 8th grade students participating in the 2000 NAEP. Certain features were common to math instruction in general. Across schools and among individual students there was minimal variation in the amount of time allotted to learning math; on average, the students devoted 2.5 hours daily to math lessons in school with an additional half hour at home. The most prevalent mode of instruction was still a didactic, basic skills approach as opposed to an emphasis on reasoning and communication. In descending order, the most common instructional techniques were textbook learning, real world problem-solving, discussing math, and collaborative work. Project-based learning and writing about math were fairly rare.

There remain significant differences in performance with regard to race and ethnicity even after controlling for SES. The most marked distinction is between predominately White and predominately African American schools, with a less pronounced difference among African American and White students within the same school (Wenglinsky, 2004). On the positive side, the performance of individual students showed that teachers' classroom instruction could exert a strong influence on the performance of African American students. Spending more time engaged in math learning has the most substantial effect on performance. Solving real world problems also has a favorable impact. Wenglinsky's main conclusion is that 8th grade teachers have the power to raise the math performance of students of color by their choice of instructional strategies.

Teacher Preparation and Professional Development

Technology Standards

Bybee and Loucks-Horsley (2000) regard the Technology Standards as "a powerful set of policies to guide the improvement of education programs and classroom practices" (p. 15). Their attitudes toward the Technology Standards reflect those of authors like Berry (2003) and Haycock (2001) toward the NCTM Standards. That is, the Technology Standards offer guidelines for charting a positive course of instruction, but it is how teachers translate the Standards into actual classroom practice that dictates whether or not they improve student learning (Bybee & Loucks-Horsley, 2000). Technology infusion calls for an innovative model of professional development that promotes teachers' ease with the medium and their understanding of how it can best be used to optimize learning. Evoking the ACOT researchers observation that technology integration is a gradual process (Dwyer, 1994; Dwyer et al., 1991), Bybee and Loucks-Horsley (2000) note that:

> Professional development for teachers will require time and ongoing support as teachers study and change their instructional materials, the work produced by the students, and the ways that the experiences they provide the students help develop critical new knowledge and skills that the standards represent. (p. 16)

Loucks-Horsley (2000) outlines four basic conditions for optimal technology professional development. First, teachers need to enhance their technology knowledge skills in conjunction with opportunities to deepen their subject knowledge. Second, teachers need opportunities to learn to synthesize subject knowledge and technology.

Third, teachers need resources and motivation to drive ongoing efforts to keep abreast of rapid technological advances. Finally, teachers need professional development programs that are comprehensive, strategic, and focused. The strategies she advises include critical self-reflection, systematic assessment of student learning and of their own teaching practices, action research, and coaching.

Despite the professed acceptance of technology as a valuable and transformative learning tool, empirical research indicates that of all professional groups, teachers are the most reluctant to use technology (Yildirim, 2000). Strategically designed professional development programs can effectively alter negative attitudes and enhance teachers' confidence in applying classroom technology. Another promising option is recruiting technology teachers from populations outside of traditional teacher education through alternative certification.

Young-Hawkins (1996) is an advocate of this approach. There are several advantages to seeking technology educators through alternative routes. Broadly, it increases the talent pool by recruiting individuals who are not attracted by traditional teacher education programs. Most are adults who bring with them knowledge and experience. Many have specific subject matter expertise, which is especially important for capitalizing on the potential of information technology. Most pertinent to the present study, "Alternative certification encourages diversity in the classroom, which encourages role modeling and promotes learning by drawing relevant experiences from children's backgrounds to enhance cognitive development" (Young-Hawkins, 1996, p. 27).

Haberman (2005) argues that adults with life and work experience make superior teachers, particularly of urban students. Using the Urban Teacher Selection Interview, Haberman found that one in three teacher candidates over age 30 passes the interview compared to one in 10 candidates under age 25. In view of the persistent difficulty of recruiting and retaining qualified teachers in urban school district, this finding warrants serious attention. Teachers who are dedicated and confident have the greatest success in improving educational outcomes for diverse urban students (Darling-Hammond & Falk, 1997).

Troops to Teachers is an innovative partnership between the Department of Education and the Department of Defense (Feistritzer, 2005). The program provides military personnel with opportunities to pursue careers in public education. Since its inception in 1994, *Troops to Teachers* has successfully brought more men and minorities into teaching and supplied qualified teachers for urban inner cities and high demand subject areas (specifically, math and science). Program graduates are confident in the belief that all children are capable of learning and have high rates of retention. Young-Hawkins (1996) agrees that capitalizing on the knowledge and skills of military veterans is an excellent way to expand the pool of talented technology educators. The prevalence of African American men among *Troops to Teachers* graduates means that their students are offered exemplary role models for academic commitment.

Classroom Applications

A review of the literature yielded only a single example of a culturally relevant computer-based lesson. Leonard, Davis, and Sidler (2005) grounded their exploratory study in the tenets of technology standards and culturally relevant pedagogy. Their design model was Learning-for-Use (LfU), which is based on four principles: (a) the incremental nature of knowledge construction, (b) the goal-directed nature of learning, (c) the situated nature of knowledge, and (d) the need for procedural knowledge (Leonard et al., 2005, p. 267). The software program they chose is *Riding the Freedom Train*, which links a narrative of the Underground Railroad with math and science applications. The participants were three fourth grade school teachers (White, African American, and Asian) representing one charter and one public school, and their students. Nearly all students in both schools were low-income African American children.

The results were overwhelmingly positive. The students were highly engaged by the program (Leonard et al., 2005). They displayed high levels of motivation and persistence and remained engrossed in their activities throughout the duration of the lesson. The culturally relevant lesson was enriched by graphics, sound, and feedback that heightened the students' interest and involvement. Leonard et al. point out that goal-direction was built into the program; in the multimedia simulation of a slave's escape, they were required to complete math and science problems to aid his journey to Philadelphia. The researchers noted that, "none of the students gave up," continuing until they finished the program or the allotted time was up (Leonard et al., 2005, p. 279).

While highlighting the program design as a key factor in the students' involvement, Leonard et al. (2005) do not downplay the role of the teacher. They emphasize that teachers' pedagogical attitudes play a vital part in teaching with technology. They also noted that even without the software program, the students performed well in science due to a culturally relevant and rich accompanying text. Both the culturally congruent story and the multimedia design were factors in the students' intense task motivation.

Teacher Perceptions

Teacher and Student Efficacy and Academic Achievement

Darling-Hammond (1998) observes that, "In response to an increasingly complex society and a rapidly changing, technology-based economy, schools are being asked to educate the most diverse student body in our history to higher academic standards than ever before" (p. 7). This ambitious task demands highly skilled teachers who have a deep understanding of subject matter and a parallel understanding of how students learn. Individually and collectively, teachers require a strong sense of efficacy to fulfill the demands of high-stakes testing and NCLB. As a result, teachers' beliefs in their abilities to influence the academic and motivational outcomes of students take on added significance.

Students of color make up about 30% of our public school population and the numbers are steadily increasing, whereas the numbers of teachers of color, especially African American teachers, are declining. African American teachers make up about 5% of the teacher population. Interestingly, many teachers, whether African American or White, do not feel that they are equipped or trained to meet the educational needs of African American students (Ladson-Billings, 2009). A powerful characteristic of effective and culturally responsive teachers according to McKinley (2010), is an awareness of their individual cultural styles and student biases and how they affect student achievement.

The efficacy beliefs of students and teachers are interrelated. Students' self-efficacy perceptions influence their motivation, self-regulation strategies, and persistence in achieving desired goals (Pajares, 2001; Pajares & Schunk, 2001). Teachers boost students' self-efficacy by using innovative teaching strategies and assessments, as well as through modeling, feedback, and setting goals that are simultaneously challenging and attainable. Efficacious teachers are the most likely to employ these strategies; they typically feel comfortable using a repertoire of techniques and are not daunted by "difficult" students (Tschannen-Moran et al., 1998). At the school level, low collective efficacy can demoralize both students and faculty, while high collective efficacy raises teachers' confidence and morale and translates into higher student performance.

Student Self-Efficacy and Academic Achievement

According to Bandura (1986, 1997), there are four main influences on self-efficacy. The strongest influence is *mastery experience*. This implies that success is attained by working through challenges rather than relying on easy tasks. Overcoming challenges builds resilience and reinforces self-efficacy beliefs. Self-efficacy is also developed and reinforced through vicarious learning or *modeling.* Bandura emphasizes that the effectiveness of modeling is influenced by one's perceived similarity to the model. The validity of this point is underscored by authors who emphasize the importance for African American students of having positive role models for academic success (Edwards, Kahn, & Brenton, 2001; Hunter, 1999; Shinew, Hibbler, & Anderson, 1999; Thompson & Lewis, 2005). There is often special emphasis on the importance of role models in influencing the academic choices of African American males.

A third source of self-efficacy is *social persuasion*, which refers to positive appraisals and encouragement and support for effort (Bandura, 1986, 1997). The encouragement must be realistic and set within the context of an experience that is likely to be successful. Effective teachers of African American students display this type of behavior by creating a caring, supportive learning environment with high expectations for all students' success (Gay, 2010; Ladson-Billings, 1994).

The fourth source of self-efficacy is the person's somatic and emotional states (Bandura, 1986, 1997). Stress, tension, anxiety, and depressed mood diminish self-efficacy while positive mood and enthusiasm intensify it. The relationship works both ways. Individuals with high self-efficacy approach tasks confidently, optimistically, and energetically while those with low self-efficacy may approach the same tasks apprehensively.

Teacher Efficacy and Academic Achievement

The concept of teacher efficacy entered the educational lexicon in the 1970s in a research project conducted by the RAND organization. Teacher efficacy was conceptualized as "the extent to which teachers believed that they could control the reinforcement of their actions, that is, whether control of reinforcement lay within themselves or the environment" (Tschannen-Moran et al., 1998, p. 202). Students' performance and motivation were thought to be the main reinforcement of teachers' efficacy beliefs. Efficacious teachers felt they could control, or at least exert a strong influence, over students' academic performance and motivation.

Although the RAND research was published at about the same time that Bandura introduced the concept of self-efficacy, the RAND researchers based their conception of teacher efficacy on Rotter's locus of control theory, not Bandura's social learning theory (Tschannen-Moran et al., 1998). However, Bandura's theory lends itself to explaining the actions of teachers who set high achievement standards for their students and are determined to overcome barriers to achieving them. Noting that the dual theoretical constructed have led to a "lack of clarity about the nature of teacher efficacy," Tschannen-Moran et al. (1998, p. 203) propose that a model of teacher efficacy should synthesize elements of the two.

The RAND researchers identified two types of teaching efficacy: *general teaching efficacy* (GTE) and *personal teaching efficacy* (PTE). GTE refers to the relative importance that teachers attribute to factors outside the control of the school in impacting student outcomes as opposed to the influence of teachers and schools. PTE denotes teachers' confidence in their own ability to persist through barriers to influence student performance (Tschannen-Moran et al., 1998). Research supports the existence of these two forms of teaching efficacy although there is more agreement on the nature of PTE. PTE reflects Bandura's self-efficacy whereas GTE is more consistent with Rotter's locus of control.

The most popular instrument for assessing teacher efficacy is Gibson and Dembo's teacher efficacy scale (TES), which combines conceptual elements of both the

RAND model and Bandura's self-efficacy theory (Tschannen-Moran et al., 1998). The TES uses the construct of PTE and operationalizes GTE (labeled teaching efficacy) in terms of outcome expectancy. The dual factor structure means that the TES measures teachers' perceptions of their competence as well as their attitudes toward the influence of external factors such as students' family backgrounds and sociodemographic characteristics.

Henson, Kogan, and Vacha-Haase (2001) analyzed the reliability of four instruments used to evaluate teacher efficacy and teacher locus of control by means of a research review consisting of 52 studies published from 1981 through 1999. The four assessment tools were the TES of Gibson and Dembo and the Science Teaching Efficacy Belief Instrument (STEBI) for measuring self-efficacy beliefs, and the Teacher Locus of Control and Responsibility for Student Achievement for measuring locus of control.

Henson et al. (2001) found considerable variability in the reliability of the four instruments. The researchers deemed the mean reliability coefficients to be acceptable while acknowledging that what represents acceptability is "a somewhat arbitrary decision and ultimately determined by the context of the study" (p. 415). For the TES, they observed that the PTE subscale showed more robust integrity than the GTE subscale, suggesting that the GTE subscale is more susceptible to measurement error. This is consistent with the assumption that there is more confusion over the meaning of GTE compared to the PTE (Tschannen-Moran et al., 1998). The STEBI, derived from the TES, yielded similar results. Henson et al. (2001) noted that even the PTE showed some variation in reliability estimates. They support the efforts of Tschannen-Moran et al. (1998) in developing a more unified model of teacher efficacy.

Teacher Efficacy and Diversity

Teachers in schools that effectively support the academic success of diverse student populations display several common qualities. They offer students challenging, interesting, and rewarding learning experiences using a variety of strategies and materials to promote thinking, creativity, and production (Darling-Hammond & Falk, 1997). They stimulate interest and enthusiasm in students with different learning styles and multiple intelligences, soliciting student input, and providing ample opportunities for authentic, experiential learning. They draw on conceptual and reasoning skills, using problem solving, inquiry, and experimentation to generate intrinsic motivation for learning. They deploy a broad range of teaching strategies including demonstrations, small group activities, peer tutoring, and individualized independent work as well as didactic instruction.

The teachers described by Darling-Hammond and Falk (1997) easily display high levels of self-efficacy. However, many teachers feel poorly prepared to teach students from low-income or ethnic minority backgrounds and convey low expectations for their success. This pervasive phenomenon has generated research into professional development programs designed to enhance teachers' efficacy for working with diverse students (Tucker et al., 2005). One such program is a training model based on Carolyn Tucker's Self-Empowerment Theory (SET) and a research-based model partnership education program for low-income African American children (Model Program). The

Model Program is a culturally relevant community-based after-school program that has demonstrated a significant positive impact on students' academic achievement. The SET is grounded in the assumption that the students' behavior and academic success or failure are affected by: (a) self-motivation to attain academic and social success, (b) perceived self-control over one's behavior and academic success, (c) self-reinforcement for engaging in positive behaviors, (d) adaptive skills for life success, and (e) engagement in success-oriented behaviors. Tucker et al. note that the SET is consistent with Bandura's theories of self-efficacy and self-regulation. The framework was derived from extensive research with low-income African American children.

Tucker et al. (2005) explored the effect of a teacher training workshop based on core tenets of the Model Program on the efficacy beliefs in a study of 62 experienced teachers (43 European Americans and 19 African Americans). All teachers were employed in schools with comparable demographic profiles and a "D" grade on statewide student performance assessments. Participating schools were randomly assigned to one of three conditions: (a) teacher training only, (b) school-wide intervention (all staff members received training), or (c) a no-training control group.

Participation in the training program exerted a significant positive impact on teachers' sense of self-efficacy for working with diverse students. Tucker et al. (2005) attribute its success to several program components. First, the teachers were made aware of the multiplicity of external factors (social, cultural, political, school, neighborhood, family, parent) that affect children's academic and social behavior. This understanding enhanced their appreciation of their role to overcome challenges to helping their students achieve school success. The teachers learned strategies to use to empower their students drawn from Bandura's (1986, 1997) four influences on self-efficacy. Teachers and other school personnel were encouraged to share ideas and experiences, a hallmark of effective professional development (Darling-Hammond, 1998). Reflecting Ladson-Billing's (1994) emphasis on the importance of a culturally relevant pedagogy for teaching African American children, the workshop included training on cultural sensitivity. The teachers also learned strategies for individualizing instruction to accommodate different learning styles and perceptual preferences.

Teacher Efficacy and Mathematic Academic Achievement

Lin and Tsai (1999) explored the efficacy beliefs of prospective and practice math and science educators in Taiwan. The teachers were divided into three groups: novice (preservice teachers), beginning (first-year teaching students), and expert teachers (averaging 11 years of professional experience). The participants in all three groups were selected on the basis of outstanding performance.

Not surprisingly, the expert teachers were the most confident that their ability and efforts would exert a positive impact on student learning while the novices were the least confident (Lin & Tsai, 1999). The relative levels of efficacy in the three groups of teachers were reinforced by qualitative accounts of issues related to teaching. The comments of expert teachers reflected more confidence in the areas of teachers' personalities and teaching style, collegial relationships, professional growth, and interactions with parents and community members. Nonetheless, quantitative and qualitative analyses revealed relatively high levels in all three participants groups. Lin and Tsai attribute this to the fact that all were chosen for their superior performance. Schools high in collective efficacy serve as excellent orientation for new teachers, enhancing their personal teaching efficacy (Tschannen-Moran et al., 1998).

Teacher Efficacy and Technology

Drawing on Bandura's (1986, 1997) four sources of self-efficacy, Wang et al. (2004) explored the impact of vicarious learning experiences and goal setting on preservice teachers' self-efficacy for technology integration. The participants were 280 education students, the majority first and second year undergraduates, with most majoring in elementary or secondary education. Most participants appraised themselves as "somewhat confident to confident" in their capability to teach with technology (Wang et al., 2004, p. 234). However, few expressed attitudes consistent with effective technology integration. As a group, the teachers believed that "abundant" computer practice and knowledge of computer programs was appropriate preparation for teaching with technology; few thought in terms of collaborating with colleagues or experimenting with different computer programs. In short, the prospective teachers had minimal understanding of effective practices for technology teaching and integration.

The student teachers were divided into 18 lab sections representing three experimental conditions and a control group (Wang et al., 2004). Participants who had opportunities for vicarious learning related to successful technology integration (through the use of VisionQuest CD-ROM) reported significantly higher increases in self-efficacy perceptions for technology infusion than those not exposed to vicarious learning. This occurred irrespective of goal setting. Working toward specific goals also acted independently to boost self-efficacy perceptions. Not unexpectedly, the synthesis of vicarious learning and goal setting had the most pronounced impact on the student teachers' perceptions of self-efficacy related to technology integration. Wang et al. emphasize that their study only examined *perceived* self-efficacy, calling for future research to explore the effect of high self-efficacy on student teachers' actual use of technology integration.

Mayo et al. (2005) conducted a three-year study of a technology training program designed for prospective teachers of grades Pre-K-12. The program was designed to prepare teacher candidates to create technology rich lessons that effectively promote students' achievement of lesson plan goals. The program was embedded in a university mentorship professional development program. The researchers followed the teacher candidates from their first semester in a two-semester internship to their first year of classroom teaching.

Mayo et al. (2005) note that the traditional approach to technology education in teacher education programs was teaching computer skills in isolation while leaving prospective teachers to navigate technology infusion on their own initiative. The internship program situated technology training in the context of lesson planning and classroom instruction. The follow-up study demonstrated the wisdom of this approach. Specifically, "The training taught future teachers to effectively integrate technology into lesson plans so classroom students used technology to demonstrate mastery of lesson plan objectives" (Mayo et al., 2005, p. 11). The success of the program was due to the combined effects of the program structure, the support and assistance of mentors in the classroom setting, and ongoing access to resources. The program fostered comfort with technology integration, which translated into higher technology use in the classroom.

The teacher candidates who participated in the technology program reported higher self-efficacy beliefs regarding technology integration and used technology more frequently in their lessons than a group of alternative certification teachers who completed comparable coursework but did not have the internship in technology integration (Mayo et al., 2005). The alternative certification teachers actually spent more time using technology, which Mayo et al. attribute to intensive district professional development efforts. However, the literature suggests that technology professional development activities may not be designed to effectively promote technology integration.

Cultural Responsiveness to Teaching Mathematics

Cultural Influences and Math Achievement

Learning styles advocates are diligent in emphasizing that it is important not to over-generalize about the preferences, attitudes, or actions of any population group (Allen & Boykin, 1992; Berry, 2003; Shaughnessy, 1998). Theories of cultural influences on the math performance of American students in general, or according to race, gender, or ethnicity, are simultaneously supported and refuted in the empirical literature.

There is a prevalent misconception in American culture that mathematical ability is something that one either has or does not have naturally (Ladson-Billings, 1994). While it is often expressed by adults, young students do not seem to share this attitude.

A study of White and African American 7th grade students from a range of socioeconomic classes found that across ethnicity and socioeconomic status, the students attributed math performance to effort over ability (Mooney & Thornton, 1999). Even students who boasted about their ability in math gave higher priority to effort for their success. African American students were most adamant in their belief that effort is the cornerstone of mathematics success. Observing this attitude in gifted African American students, Ewing and Yong (1992) attribute it to the encouragement of parents who view their children's success as a reflection on the group.

A recent study reported high achievement orientation among African American males. The data were drawn from responses of more than 34,000 African American, Asian American, Latino, and White middle and high school students from 15 suburban school districts that are part of the Minority Student Achievement Network (MSAN) (Ferguson, 2003). African American and Latino students were even more likely than White students to say that their friends think it is "very important" to "study hard and get good grades" (Ferguson, 2003, p. 1). This position was more strongly endorsed by females than males. Among the African American students, it was supported by 61% of females (second to Asian females) and by 51% of males, the highest proportion of any male group. Only a small proportion of students from any ethnic group reported that their friends look down on students who do well academically.

The MSAN study supported the notion that structural barriers rather than cultural attitudes are the main impediment to the academic success of minority students (Ferguson, 2003). African American and Hispanic students were least likely to have more than one computer at home. Among students at the same course level, they were more likely than their Asian or White peers to say they understood the teacher's lesson roughly half of the time or less. Nearly half the African American students related this (48%), followed by Latinos (46%), Asians (32%), and Whites (27%).

MSAN founder Allan Alson attributes the discrepancy to the quality of instruction. Endorsing a viewpoint that commonly surfaces in the literature, Alson states that, "How well students understand what they're being taught or what they're asked to read depends a great deal on *how* [original emphasis] they are being taught and what kinds of support are in place to encourage learning" (Ferguson, 2003, p. 1). Alson (as cited in Ferguson, 2003) advises that to improve learning, educators "must listen more carefully to what students are telling us, supply new resources, and craft new strategies that will fundamentally alter school practice" (p. 2). Creatively used, technology offers an excellent way to "craft new strategies."

The students' responses yielded differences and commonalities across ethnic groups. The most striking difference is the students' attitudes toward teachers motivational strategies. Nearly twice as many White students as African American students cited "teacher demands" as motivation to "work really hard" (Ferguson, 2003, p. 2). African American students responded most favorably to "teacher encouragement." Numerous sources reviewed for this project cite teachers' encouragement, or a "pedagogy of caring" as a crucial factor in the success of African American students (Banks et al., 2001; Gay, 2002; Ladson-Billings, 1994).

The majority of students in each ethnic group said they tried hard at school to please their parents and noted that their parents paid attention to their grades (Ferguson, 2003). Interestingly, more African Americans than students of other groups endorsed the view that their teachers were aware of their academic capabilities (39%). Although it means there is still much room for improvement, it may reflect intensive professional development efforts in African American communities. While conceding that there remain “challenges” to educational equity, the MSAN researchers noted that overall, more than three-quarters of students surveyed said they enjoyed school.

The MSAN researchers noted that their findings counteract common preconceptions that African American and Latino students have an “anti-school” attitude (Ferguson, 2003). A pervasive belief is that this attitude is especially common among African American males. Based on his own research and that of others, Osborne (1999) observes that African American students, and males in particular, often have lower identification with academics than students of other cultural groups. Specifically, academic success has less influence on their self-esteem; rather than indicating high self-esteem, it raises their risk of being alienated from school. Osborne notes that this is a fairly recent phenomenon. As such, it is conducive to being altered. Osborne also emphasizes that many African American boys do identify with academics, as the MSAN study confirms (Ferguson, 2003). Like Alson, Osborne (1999) strongly believes that the actions of school districts, schools, and individual teachers have the power to reverse negative trends and reinforce academic achievement orientation in African American students. Osborne (1999) does not discount that there are social influences that undermine the academic identification of African American students.

Academically promising students are invited to join the MAC Scholars (Minority Achievement Committee Scholar), which includes regular meetings for discussing how to deal with peer pressure and improve school achievement. The students wear special symbols, learn special greetings, and participate in an annual award ceremony for exemplary academic performance. All activities are designed to instill pride in academic achievement, and the MAC Scholars are generally admired as good role models by their peers. The MSAN researchers cited professional development initiatives in the Shaker Heights City School District for fostering mutually trusting and positive relationships between teachers and African American students (Ferguson, 2003).

Sankofa et al. (2005) presented 80 suburban African American students, ranging in ages from 8 to 11, with four scenarios in which a high-achieving student is portrayed as having one of four learning orientations. Two scenarios depicted a student who was individualistic or competitive, reflecting mainstream American values. Two scenarios reflected communalism and verve, characteristic of African American cultural style. The students were asked to rate their attitudes toward the high achiever in each scenario.

The students were generally favorable toward the high achievers displaying each cultural orientation (Sankofa et al., 2005). At the same time, they were significantly more positive toward the two students who reflected an African American cultural style. They also predicted that parents and peers would share their higher appraisal of the students exhibiting communalism and verve. Sankofa et al. noted that the children were bused to their suburban school from a low-income community thus they may have been especially sensitive to incongruities between the values of their families and the school. They propose that many African American students will perform better academically in a classroom that matches their learning style.

Berry (2005) presented the experiences of two African American middle school boys who excelled in mathematics. One boy, Phillip had initially been referred as possibly having attention deficit hyperactivity disorder (ADHD) by a White teacher in second grade before being identified as gifted by his Black third grade teacher. According to Gay (2002), such occurrences are not unusual. Students displaying African American cultural attributes such as verve may be misdiagnosed as hyperactive, while low expectations preclude recognition for their abilities. Indeed, Phillip’s mother attributes the second grade teacher’s impression of his behavior to lack of cultural understanding (Berry, 2005). The second boy, Bilal, was given special encouragement by his parents, who felt that as an African American male, his school would not expect him to succeed; thus, he had to surpass other students to stand out. Both students are enrolled in a Mathematics/Science Pre-College program and looked upon favorably by teachers and peers.

The resilience of both students was shaped by early experiences with institutionalized racism and strong family, school, and community support to counterbalance it (Berry, 2005). Spirituality was a prominent theme, and is often a powerful resource for African American families (Berry, 2003; Gay, 2010). Berry

(2005) cited both students' involvement with the advanced academic program, church, and athletics as major influences on their confidence and academic identification.

The Mathematics/Science Pre-College program offers students enriched learning experiences and ample opportunities for hands-on learning to stimulate academic interest. In addition, the students related that the program fostered the development of positive habits and helped them develop a future goal orientation in addition to providing rewarding learning experiences (Berry, 2005).

There are some innovative school and community programs that provide students of all ability levels with comparable opportunities for academic enrichment. A notable example is the Math Corps Summer Camp in Detroit, a program designed for inner city African American students (Edwards et al., 2001). Participants range from struggling students to high achievers immersing themselves in math. The program has successfully improved the grades of students at all levels.

Another successful program is the Academic Cultural Enrichment (ACE) Mentorship Program, an after-school program in Champaign, Illinois, created to promote resiliency and competency in at-risk African American students from ages 6 through 14 (Shinew et al., 1999). Designed to instill participants with a positive Black identity, ACE works to help students develop strong math, reading, oratorical, and analytical thinking skills. A prominent theme in interviews with ACE parents is the exposure of children to role models for academic achievement and excellence. One parent specifically commented on how the children were inundated with images of young Black men carrying books and engaging in academic activities. The parents unanimously perceived the young, African American staff members as exemplary role models.

Muhammad (2003) opined the significance of providing learning activities and experiences that allow mathematics teachers of African American students to do an assessment while the students are engaged in the learning process. He suggests that teachers use several methods to assess students such as having the students utilize technology (computers, overhead projectors, video, etc.), to explain rules, concepts, or principles. A recent study by Nguyen, Hsieh, and Allen (2006) echoed this concept of technology assessment in their study where the effects of web-based assessment and practice were investigated as they related to students' mathematic learning attitudes. In the study, African American males reported that they enjoyed the computer math because it made the problem-solving process easier, it made them smarter, and that it was exciting and challenging. The web-based assessment and practice revealed that students gained confidence in math problem solving as well as gave them motivation to learn mathematics. Students also felt that they had more control over their own learning due to the more immediate feedback of the web-based assessment, which also reduced the anxiety about learning math.

Matching Learning Styles and Instruction for Improvement of Academic Achievement in African Americans

The exploration of African American cultural styles is a fairly recent phenomenon. Research on learning styles has a long history in education. The widely used framework for assessing the learning styles of elementary and secondary school students is the Dunn and Dunn Learning Style Model. The Learning Styles Inventory (LSI) encompasses five dimensions: (a) *environment* (sound, light, temperature, and seating comfort); (b) e*motionality* (motivation, persistence, responsibility, and need for internal or external structure; (c) *sociological* (learning alone, with a partner, with a group or team of peers, or with a collegial or authoritative adult; also learning in a variety of ways or in a consistent pattern); (d) *physiological* (auditory, visual, tactile and/or kinesthetic perceptual preferences; need for food or liquid intake; time-of-day energy levels; mobility); and (e) *global or analytic processing inclinations* (through connections with sound, light, design, persistence, peer orientation, and intake scores).

The LSI has been applied to students across the spectrum of academic achievement and representing diverse ethnic, cultural, and national groups. The most striking differences emerge between gifted and lower-achieving students (Shaughnessy, 1998). Gifted students tend to be remarkably similar regardless of cultural heritage. A study of gifted African American, Mexican American, and Chinese American middle school students found students of all three groups to be responsible, motivated, and persistent (Ewing & Yong, 1992). African American students, in particular, scored high on persistence, a finding consistent with the emphasis they place on effort in mathematics achievement (Mooney & Thornton, 1999).

African American students displayed the strongest preference for kinesthetic learning, whereas the Chinese American students were highly visual (Ewing & Yong, 1992). Auditory learning was least popular among all students. In fact, across ethnicity, gender, and ability levels, auditory learning has the least appeal. Ironically, it is the primary mode of instruction in most American classrooms.

This situation is especially challenging for lower ability students. Dunn (as cited in Shaughnessy, 1998) observes that while gifted students often prefer kinesthetic or tactual learning, their higher ability enables them to adapt to various forms of instruction. On the other hand, low-achieving students may have only one perceptual channel through which they can master complex information. Thus, if they are inclined toward kinesthetic or tactual learning, the typical focus on auditory and visual instruction leaves them “at risk.”

According to Dunn (as cited in Shaughnessy, 1998), there are seven learning style traits that are common to most at-risk students: (a) need for frequent mobility, (b) reasonable choices of how and with whom to learn and with what learning materials, (c) a range of instructional resources, environments, and groups as opposed to a routine pattern, (d) learning opportunities scheduled in late morning or later in the day, (e) informal seating, (f) soft lighting, and (g) tactual/visual introductory learning reinforced by kinesthetic/visual resources or the reverse. Technology has the potential to adapt instruction to meet these conditions, providing teachers computers to create stimulating learning experiences and not for repetitive drill and practice (Swain & Pearson, 2003).

A large body of research documents that capitalizing on students’ individual learning style preferences has a strong positive impact on academic achievement (Burke & Dunn, 2002; Lovelace, 2005; Shaughnessy, 1998). The adoption of a learning style curriculum is especially beneficial to underserved and economically disadvantaged students (Burke & Dunn, 2002; Klavas, 1994). Research involving school districts throughout the country show that “previously poorly achieving underserved students earned statistically higher achievement test scores after only one year of a learning style approach” (Burke & Dunn, 2002, p. 105). Furthermore, the gains were not transient; they continued through two or more years of monitoring.

The adoption of a learning styles curriculum by a failing North Carolina school resulted in a remarkable drop in disciplinary problems and gains on standardized test scores (Klavas, 1994). Within three years, the school’s reading and math scores on the California Achievement Test soared from the 30th percentile to the 83rd. African American students made the most impressive gains.

Using data from 76 studies of children, adolescents, and adults, Lovelace (2005) conducted a meta-analysis of research on the Dunn and Dunn Learning Style Model. The analysis showed that matching instruction to students’ learning styles had a “consistent and robust” effect that was “practically and educationally significant” (p. 181). The strength and scope of these findings led Lovelace to recommend a learning styles approach for raising achievement and improving attitudes toward learning for students of all types.

Summary

A review of the literature shows that most African American students, male and female, value academic achievement and aspire to do well in school. For low-income urban students, the main barrier to math achievement is often the absence of a rigorous mathematics curriculum. There is powerful evidence that even poorly performing students thrive in an academically challenging math environment. This is especially true when instruction is matched to their learning style preferences. The overarching finding is that teachers' adoption of pedagogical practices that are congruent with students' learning styles raise achievement for students of all performance levels.

Although there is an abundance of research that yield teachers' use of instructional technology in classrooms have a significant positive impact on students' academic achievement to include African American students, the literature review revealed minimal research that specifically investigated a relationship between African American male students' math academic performance and teachers' use of instructional technology. Technology offers an excellent vehicle for adapting instruction to the individual needs and preferences of all students' academic performance and their teachers' use of instructional technology. Yet, despite its promise, there is a definite gap between the rhetoric of the Technology Standards and teachers' actual classroom practices. A parallel phenomenon exists with regard to the NCTM Standards and math instruction. Two promising strategies for overcoming this obstacle are structured professional development programs and recruitment of technology educators through alternative certification programs.

The literature offers minimal support for theoretical assumptions that African American males have culturally ingrained negative attitudes toward academic achievement. There is abundant evidence that most students do well in a learning environment with adequate resources and skilled, confident, culturally responsive teachers.

CHAPTER III

METHODOLOGY

This study examined the relationship between the level of technology that is implemented in the classroom and the Texas Assessment of Knowledge and Skills (TAKS) scores in the mathematics for 6^{th}, 7^{th} and 8^{th} grade African American male students. Due to the standards and accountability movement, as well as NCLB, middle schools have focused on academic achievement in recent years as opposed to simply meeting the social, emotional, and psychological needs of early adolescents (Juvonen, Le, Kaganoff, Augustine, & Constant, 2004).

The serving school district's mission includes preparing each student academically to be a critical thinker and problem solver and its objectives include demonstrating sustained growth in student achievement. It should also be noted that this school district is rated as the 2^{nd} best large school district in Texas for educating African American students according to studies by Texas A&M University, Texas A&M University-Prairie View, and Beloit College. The participating district has won many awards that attribute to being a highly performing school district to include the 2009 Broad Prize for education, the Texas Quality Award in 2006 and the H-E-B Excellence in Education Award in 2008. This district has also earned 7 Recognized ratings since 1996.

The following research questions were formulated and examined in the study:

1. What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?

2. What are the teachers' perceptions of their level of use of instructional technology when teaching math objectives to African American males?
3. What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?
4. What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?
5. What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students in mathematics?
6. What is the relationship between the activities teachers use teaching mathematics objectives and how effective are the activities in teaching mathematics to African American male students?

This chapter is divided into the following eight sections: (a) Type of Research Design, (b) Population, (c) Sampling Procedure, (d) Instrumentation, (e) Validity of the Instrument, (f) Reliability of the Instrument, (g) Data Collection Procedure, and (h) Statistical Analysis.

Research Design

The quantitative survey design was employed in this investigation to collect and analyze the data. The quantitative survey design allowed the researcher the opportunity to assess the attitudes, perceptions, opinions, behaviors, and motivations of individuals regarding a certain phenomenon or object (Selltiz, Wrightsman, & Cook, 1976).

Quantitative survey designs, like other kinds of research framework, have their methodological weaknesses. One of the key weaknesses in this type of design is that the information generated often lacks sufficient depth. Consequently, the description obtained from this methodology tends to be circumscribed to its temporal location and thus lacks the strengths that accompany protracted observations (Kerlinger, 2002).

Although the survey design has its methodological limitations, there are several advantages to its use that tend to outweigh its disadvantages. Those advantages according to Creswell (2009) enable the researcher

1. To collect detailed factual information that describes existing phenomena about a population;
2. To identify problems or justify current conditions and practices that are occurring within a population;
3. To make the comparisons and evaluations of a population; and
4. To determine what others are doing with similar problems or situations and thus benefit from their experience in making future plans and decisions.

In sum, as Kerlinger (2002) notes, the methodology of survey research, like that which was employed in this study, can be conceived of as an inquiry into the uniformity or regularity of some phenomena. The use of the survey design provides the most effective, efficient, and economical means for studying whether African American male students' academic achievement level can be positively impacted by teachers' use of instructional technology.

Population

The population of this study consisted of 6th, 7th, and 8th grade teachers employed in an urban school district in the southwestern portion of the United States. The population also consisted of the students enrolled in these teachers' classes.

The teacher population of the district was approximately 3,733 (Table 1). Fifty-one percent (or 1,885) of the teachers reported their ethnic status as European Americans and 33 (or 1,214) identified themselves as African American. In addition, 15% (or 563) of teachers indicated they were Hispanic American and 2% (or 69) said they were Native American. Finally, less than one-tenth of 1% (or 2) reported their ethnic identify as Native American.

Table 1. Ethnic Status of the Teachers in Target District

Ethnicity	Population	Percent
European American	1,885	51.0
African American	1,214	33.0
Hispanic American	563	15.0
Asian/Pacific Islander	69	2.0
Native American	2	.1
Total	3,733	100.0

Furthermore, the student population of the district contained approximately 56,255 (Table 2). Sixty percent (or 33,918) of the students identified their ethnic background as Hispanic American and 32% (or 17,836) as African American. Additionally, 6% (or 3,215) of students reported their ethnic stats as European American and 2% (or 1,238) as Asian/Pacific Islander. Also, little less than 1% (or 48) of the students reported they were Native American.

Table 2. Ethnic Status of the Students in Target District

Ethnicity	Population	Percent
European American	3,215	6.00
African American	17,836	32.00
Hispanic American	33,918	60.00
Asian/Pacific Islander	1,238	2.00
Native American	48	.08
Total	56,255	100.00

Sample

The cluster random sampling procedure was used in the present study. All participating intermediate and middle schools housed in the targeted public school district were identified by the researcher. Once identified, each above intermediate and middle schools was assigned a number from 01 to N, where N is the total number of cases.

Moreover, after this process was completed, the researcher entered a table of random numbers where 10% of the intermediate and middle schools in the district were selected. Six schools (3 intermediate and 3 middle schools) chose to participate in this study. From the intermediate schools, only 6th grade math teachers of African American male students were chosen to participate in the study. From the middle schools, 7th and 8th grade math teachers of African American males were chosen to participate in the study.

Instruments

Two instruments were used to collect data for the present investigation. They were the Middle School Students' Mathematics Teacher Survey (Appendix A), and the Texas Assessment of Knowledge and Skills.

Middle School Students' Mathematics Teacher Survey (MSSMTS)

The Middle School Students' Mathematics Teacher Survey (MSSMTS) was developed by modifying the level of use of technology survey instrument originally created by Knight (2002). This survey was originally referred to as Preparing Prospective Teacher Education Students at Two-Year Postsecondary Institutions: An Assessment of Proficiency in Technology Usage. The instrument was modified and developed to assess the preparation and perceived level of use of technology by middle school math teachers this study.

The MSSMTS consists of four major sections. Part 1 contains the background information regarding the participants. This section consists of six items. The first four items are in a non-structured format. The remaining two items are in a structured format. Item 5 was scored one to two (1 to 2) and item 6 was scored one to six (1 to 6), respectively. Part 2 of the investigative survey contained 10 technological usages of the computer to measure teacher's level of use. Each one of the components was scored on a four-point scale, one to four (1 to 4). Additionally, Part 3 of the MSSMTS consists of 12 activities teachers will implement while teaching mathematics objectives. In this section, the participants were required to indicate how often they use the activity and how effective it was. The *How Often* aspect of this section was measured on a five-point scale: (1) “Don’t Know What this is,” (2) “Never,” (3) “Sometimes,” (4) “Often,” and (5) “Almost Always.” In addition the *How Effective* aspect on this part of the instrument was measured on a four-point scales: (1) “ineffective,” (2) “somewhat effective,” (3) “effective,” and (4) “very effective.”

Finally, the final section of the Middle School Students’ Mathematics Teacher survey contains four open-ended questions under the auspice of three grade levels requesting the teachers to respond to specific questions concerning the Mathematics performance of their students. Question 1 asked, “How many students did you teach Mathematics to in the 2008-2009 school years?” Question 2, asked “How many students took the regular Math TAKS test in 2009?”; Question 3 asked, “How many African American male students met the standards on the regular Math TAKS test in 2009?”; and Question 4, asked, “How many African American male students received commended performance on the regular Math TAKS test in 2009?”

Validity of the MSSMTS

Construct validity was established on the MSSMTS by administering it to a group of experts to examine the content of each item. The group of experts agreed that the MSSMTS measured what it was supposed to measure.

Reliability of the MSSMTS

Internal consistency reliability procedure was used to establish reliability of the MSSMTS. This type of reliability determines how all items on a single test relate to all other items and to the test as a whole (Kerlinger, 2002). To determine the internal consistency reliability for the MSSMTS, the Cronbach’s alpha coefficient was used. The following coefficients were computed on each subtest of the MSSMTS: Technological usage (.85), activities (.88), and test as a whole (.82).

Texas Assessment of Knowledge and Skills (TAKS)

The Texas Assessment of Knowledge and Skills (TAKS) is the statewide assessment system used by the State of Texas to measure the academic progress of elementary students in reading, math, writing, and science. In the present study, the academic performance of the middle school students (6^{th}, 7^{th} and 8^{th}) in Mathematics will guide this investigation.

The mathematics section of the TAKS was under the auspice of six major objectives. For 6^{th} grade students, there were 46 items, 7^{th} grade students 48 items and for 8^{th} grade students, 50 items.

Furthermore, Objective 1 of the math section of the TAKS for middle school students assessed students understanding of numbers, operations, and quantitative reasoning. Objective 2 examined the students' understanding of patterns and algebraic reasoning while Objective 3 ascertained the students' understanding of geometry and spatial reasoning.

Finally, Objective 4 evaluated the students' understanding of measurement concepts and their practical application while Objective 5 assessed the students' understanding of probability and statistics. Also, Objective 6 examined the students' understanding of mathematical processes and tools.

Validity of TAKS

Content and Construct validity was established on the TAKS. The TAKS was tied directly to statewide curriculum with regard to the content of the items. Advisory Committees consisting of educators within and outside the State of Texas, independent contractors, test development specialists, and TEA staff members worked collectively within the committees to develop test objectives, instructional targets, specifications, and test item types (Texas Education Agency, 2005).

Items on the TAKS were carefully aligned with the statewide curriculum as well as for each subject area and for each grade level. A system of checks and balances for item development and review was established to eliminate bias (Texas Education Agency, 2007). Moreover, construct validity was achieved by generating factors around the academic content areas required by the statewide curriculum. Also, the students' data on the TAKS were compared with a sample of college students; the results were comparable for both groups (Texas Education Agency, 2007).

Reliability of the TAKS

Internal Consistency reliability was established on the TAKS. The Kuder Richardson Formula 20 was used to compute the internal consistency reliability coefficients for the TAKS. Internal consistency reliabilities ranging from the low .90 to the highest .80 were found on the various sections of the TAKS.

Data Collection

The researcher mailed a letter (Appendix B), together with the research proposal to the school district administration. The letter summarized the purpose of the study and outlined the methodology and procedures to be used. Once permission was granted from the school district to complete the study, each targeted school's principal was contacted to discuss the proposed study that would take place. The principal was made aware that no names would be used in the study. The principal also received a copy of the survey that was to be completed by the teacher participants at their respective schools.

At this time, a timeline for completing the survey was discussed and decided upon. Each survey included an information letter (Appendix C), that explained the survey, purpose of the study, as well as gave participants information regarding risks and benefits of volunteering for the study. The teachers were asked to respond honestly to all items on the survey to eliminate non-response. A sealed envelope was provided for the participants to return the questionnaires. The participants were instructed to place the completed surveys inside of the envelopes and to then give them to the appointed administrator who would then store the surveys in a locked drawer until all participants' envelopes are collected.

Data Analysis

Once the foregoing was completed, the researcher coded the data from the questionnaire. Likewise, the researcher entered the codes into the computer. For statistical purposes, the researcher used the applications from the Statistical Package for the Social Sciences (SPSS) to analyze the data.

Inasmuch as the variables in the present study were measured on the nominal (qualitative) scale, the Chi-Square test of Independence and the Chi-Square test of Goodness-of-Fit were used. The Chi-Square Test of Independence is a test where you may have a single population from which you derive two variables. These tests determine whether there is a significant relationship between the two variables. The Chi-Square Test of Goodness-of-Fit is a test that determines how well a model fits observed data. It answers the question of how closely the observed values are to those that are expected. The researcher obtains observed values through observation, whereas expected values are the results of some hypothesis (Hinkle et al., 2003).

Additionally, logistical regression was used, which is an extension of multiple regression and can be utilized for an analysis of data when the dependent variable is categorical or discrete with at least two values (i.e., out of school suspension and expulsion). Although similar in methodology, logistical regression has several distinct advantages over multiple regression. First, the researcher need not make any assumptions about the distributions of the predictor or, in this case, independent variables. Secondly, the (predictor) variables need not be normally distributed, linearly related or have equal variances within each group. Next, it cannot produce negative predictive probabilities; all probability values will be positive and will range from zero to one (0 to 1). Furthermore, logistic regression has the capacity to analyze predictor variables of all types (continuous, discrete, and dichotomous) and is able to produce non-linear models (Tabachnick & Fidell, 2001).

Finally, the Pearson Product Moment Correlation (Pearson r) was used. This statistical procedure was employed to examine the relationship between two quantitative interval ratio variables. In addition, the Pearson r squared (coefficient of determination) revealed the amount of variance explained between the two quantitative variables (Creswell, 2009).

All of the aforementioned inferential statistical techniques were used to determine the differences between observed and expected frequencies. The formula for the Chi-Square is as followed:

$$X^2 = \frac{\sum(f_o - f_e)^2}{f_e}$$

Where: f_o = observed frequencies
f_e = Expected frequencies
$\sum$ = Summation

All research questions will be tested at the .05 alpha level or better.

CHAPTER IV

RESULTS AND ANALYSIS

The purpose of this study was to investigate whether African American male students' academic achievement level can be positively impacted by teachers' use of instructional technology. In addition, this study examined teachers' level of preparedness in the use of technology implementation as well as their perceptions regarding their level of use of technology implementation. Finally, this study investigated the relationship between the technological activities and how effective these activities were in teaching mathematic objectives.

The sample population of this study consisted of 33 6^{th}, 7^{th}, and 8^{th} grade teachers employed in an urban, school district in the southern region of Texas participated in the study. An instrument entitled "Middle School Students' Mathematics Teacher Survey" was used to collect the data.

The data analysis for this study was accomplished under two major areas. Section one addressed the demographic profile of teachers participating in the study. Section two explained the research questions postulated in the study. The Chi-Square test of Independence and Pearson Product Moment Correlation were used to analyze the data.

Answers to the following research questions were sought:

1. What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?
2. What are the teachers' perceptions of their level of use of instructional technology when teaching math objective to African American males?

3. What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?
4. What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?
5. What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students in mathematics?
6. What is the relationship between the activities teachers use in teaching mathematics objectives and how effective are the activities in teaching mathematics to African American male students?

Description of the Subjects

There were 33 teachers who participated in the present investigation. These teachers provided math instruction to 524 students (298 6th graders, 136 7th graders and 90 8th graders). Descriptive data were computed by the teachers' gender, ethnicity, grade level, years of teaching, number of technology classes taken, and number of hours of technology training.

Gender

Regarding the variable gender, 10 or 30.3% of the teachers who participated in this study were males. By contrast, 23 or 69.7% of the teachers who were involved in the study were females (see Table 3).

Table 3. Frequency Distribution of Teachers by Gender

Gender	Number	Percent*
Male	10	30.3
Female	23	69.7
Total	33	100.0

*May not add to 100% due to rounding error.

Ethnicity

The variable ethnicity was categorized into five subgroups for this investigation. Fifteen or 45.5% of the teachers were reported as being African American and 2 or 6.1% were reported as being Hispanic American. Additionally, 12 or 36.4% were identified as White American and 2 or 6.1% were identified as Asian American. Finally, 2 or 6.1% of the respondents indicated their ethnic status as “other” (see Table 4).

Table 4. Frequency Distribution of Teachers by Ethnicity

Ethnicity	Number	Percent*
African American	15	45.5
Hispanic American	2	6.1
White American	12	36.4
Asian American	2	6.1
Other	2	6.1
Total	33	100.0

*May not add to 100% due to rounding error.

Grade Level

Three grade level groups: 6th, 7th, and 8th were designated for this study. Twelve or 36.4% of the respondents were 6th grade teachers and 12 or 36.4% were 7th grade teachers. On the other hand, 9 or 27.3% of the participants were 8th grade teachers (see Table 5).

Table 5. Frequency Distribution of Teachers by Grade Level

Grade Level	Number	Percent*
6th	12	36.4
7th	12	36.4
8th	9	27.3
Total	33	100.0

*May not add to 100% due to rounding error.

Years of Teaching

The variable years of teaching was divided into four distinct categories for this investigation. Twelve or 36.4% of the teachers reported 5 years or less of teaching experience and 5 or 15.2% of them reported 6 to 10 years of teaching experience. Moreover, 3 or 9.1% of the teachers indicated they had between 11 and 15 years of teaching experience and 12 or 36.4% said they had 16 years or more of teaching experience. There was one missing case (see Table 6).

Table 6. Frequency Distribution of Teachers by Years of Teaching

Years of Teaching	Number	Percent*
5 years or less	12	36.4
6 to 10 years	5	15.2
11 to 15 years	3	9.1
16 years and more	12	36.4
Missing cases	1	3.0
Total	33	100.0

*May not add to 100% due to rounding error.

Number of Technology Classes

For this study, the variable number of technology classes taken during professional development was categorized into four groups. Fourteen or 42.4% of the teachers reported they took 3 or less technology classes during professional development and 5 or 15.2% reported they took 4 to 6 technology classes during professional development. Additionally, 2 or 6.1% of the teachers revealed that they took 8 to 10 technology classes during professional development and 3 or 9.1% said they took 11 or more technology classes during their professional development. They were 9 missing cases (see Table 7).

Table 7. Frequency Distribution of Teachers by Number of Technology Classes Taken During Professional Development

Number of Technology Classes	Number	Percent*
3 or less	14	42.4
4 to 6	5	15.2
8 to 10	2	6.1
11 or more	3	9.4
Missing cases	9	27.3
Total	33	100.0

*May not add to 100% due to rounding error.

Hours of Instructional Technology Training

The variable hours of instructional technology training was categorized into four groups. Three or 9.1% of the participants reported they had 5 or less hours of instructional technology training and 9 or 27.3% reported they had 6 to 10 hours of instructional technology training. On the other hand, 7 or 21.2% of the respondents expressed they had 11 to 15 hours of instructional technology training and 7 or 21.2%

said they had 16 or more hours of instructional technology training. There were 7 missing cases (see Table 8).

Table 8. Frequency Distribution of Teachers by Number of Hours of Instructional Technology Training

Number of Hours	Number	Percent*
5 hours or less	3	9.1
6 to 10 hours	9	27.3
11 to 15 hours	7	21.2
16 or more hours	7	21.2
Missing cases	7	21.2
Total	33	100.0

*May not add to 100% due to rounding error.

Research Question 1

What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?

Level of Preparedness and Computer Application

Shown in Table 9 are the one sample Chi-Square results pertaining to the teachers' level of preparedness in the use of computer application. A little over 12% of teachers they were not prepared in the use of computer application and 21.2% said they were somewhat prepared in type of instructional technology. In contrast, 24.2% of the teachers reported they were well prepared in computer application, as compared with

42.4% who expressed they were very well prepared in this type of technology. A statistically significant difference was found between the level of preparedness of teachers in the use of this instructional technology (x^2 = 6.727, df = 3, p <.05) at the .05 level. Thus, teachers were statistically significantly more likely to be very well prepared in the use of computer application.

Table 9. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Computer Application When Teaching African American Males

Computer Application	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	4	7	8	14	33
Percentage	21.1	21.2	24.2	42.4	100

x^2 = 6.727   df = 3   P = .035*   *P<.05.

Level of Preparedness and Internet Correspondence

Illustrated in Table 10 are the Chi-Square results with respect to the level of preparedness of teachers with regard to the use of internet correspondence. A little over 12% of the teachers reported they were not prepared in the use of the internet correspondence, as compared to 33.3 who said they were somewhat prepared. In addition, 33.3% of the teachers expressed they were well prepared in the use of internet correspondence and 21.2% said they were very well prepared in this type of instructional technology. A significant difference was not found between the level of preparedness of teachers with respect to internet correspondence (x^2 = 4.212, df = 3, P >.05) at the .05

level. Consequently, teachers seem to have similar preparation in term of their use of internet correspondence.

Table 10. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Internet Correspondence When Teaching African American Males

Internet Correspondence	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	4	11	118	7	33
Percentage	21.1	33.3	33.3	12.2	100
$x^2 = 4.212$	df = 3	P = .035*	P = .239.		

Level of Preparedness and Presentation Skills

The Chi-Square test Goodness-of-Fit results regarding the levels of preparedness of teachers in the use of presentation skills as a use of instructional technology are indicated in Table 11. A little over 6% of the teachers reported they were not prepared to use presentation skills and 21.2% reported they were somewhat prepared to use this type instructional technology. On the other hand, 36.4% expressed that they were well prepared in the use of presentation skills, as compared to 36.4% expressed that they were well prepared in the use of presentation skills, as compared to 36.4% who said they were very well prepared to use presentation skills as a instructional technology. Statistically significant differences were found in the preparedness of teachers in the use of presentation skills at the .05 level ($x^2 = 8.33$, df = 3, $P < .05$). Therefore, teachers were statistically more likely to be well prepared or very well prepared in the use of presentation skills as a use of instructional technology.

Table 11. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Presentation Skills When Teaching African American Males

Presentation Skills	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	2	7	12	12	33
Percentage	6.1	21.2	36.4	36.4	100

x^2 = 8.333 df = 3 P = .040* *P<.05.

Level of Preparedness and Information Searching

Revealed in Table 12, are the Goodness-of-Fit Chi-Square results with regard to the level of preparedness of teachers in the use of information searching as a use of instructional technology. Teachers who reported they were not prepared to use information searching as a use of instructional technology, comprised of 6.1%, compared to 18.2% who reported somewhat prepared in the use of this technology. In comparison, 39.4% of the teachers reported they were well prepared in the use of information searching and 36.3 said they were very well prepared in the use of this technology. A statistically significant difference was found in the preparedness of teachers (x^2 = 9.788, df = 3, P <.05 level. Accordingly, teachers were statistically more likely to be well prepared or very well prepared in the use of information searching as a use of instructional technology.

Table 12. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Information Searching When Teaching African American Males

Information Searching	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	2	6	13	12	33
Percentage	6.1	18.2	39.4	36.3	100

x^2 = 9.788 df = 3 P = .020* *P<.05.

Level of Preparedness and Practice Drills

Shown in Table 13 are the one-sample Chi-Square results relative to the level of preparedness of teachers in the use of practice drills as a use of instructional technology. A little over 9.1% of the teachers reported they were not prepared to use practice drills as a technology implementation, compared to 12.1% who said they somewhat prepared to use this type of instructional technology. Additionally, 39.4% of the teachers reported they were well prepared or very well prepared to use practice drills as a use of instructional technology. A statistically significant difference was found between the level of preparedness of teachers in the use of practice drills (x^2 = 18. 364, df =3, P<.001) at the .001 level. Based on the above analysis, teachers were statistically more likely to be well prepared or very well prepared in the use of practice drills as a use of instructional technology.

Table 13. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Practice Drills When Teaching African American Males

Practice Drills	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	3	9	13	12	33
Percentage	9.1	12.1	39.4	39.4	100

x^2 = 18.364 df = 3 P = .001*** *P<.001.

Level of Preparedness and Internet Correspondence

Presented in Table 14 are the one-sample Chi-Square results regarding the teachers' level of preparedness in the use of internet correspondence and classroom instruction as a use of instructional technology. A little over 6% of the teachers indicated they were not prepared to use classroom instruction as a technology implementation compared to 27.3% who said they were somewhat prepared. Moreover, 30.3% of the teachers reported they were prepared to use classroom instruction and 36.3% said they were very well prepared in using this type of instructional technology. A statistically significant difference was not found between the level of preparedness of teachers (x^2 = 6.879, df = 3, P > .05) at the .05 level. Thus, teachers seem to have been similarly prepared in the use of classroom instruction as a use of instructional technology.

Table 14. Chi-Square Results Regarding the Level of Preparedness of Teachers in the Use of Internet Correspondence and Classroom Instruction of African American Males

Internet Correspondence Classroom Instruction	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	2	9	10	12	33
Percentage	6.1	27.3	30.3	36.3	100

$x^2 = 6.879$ df = 3 P = .076.

Research Question 2

What are the teachers' perceptions of their level of use of instructional technology when teaching math objectives to African American males?

Teachers' Perceptions and Basic Computer Operations

Indicated in Table 15 are the one-sample Chi-Square results relative to the perceptions of teachers regarding the level of use of basic computer operations as a use of instructional technology. Over 6% of the teachers reported they were somewhat proficient in the use of basic computer operations, whereas 36.4% of teachers were proficient in this type of technology implementation. In contrast, 57.6% of the teachers reported they were very proficient in the use of basic computer operation. A statistically significant difference was found between the perceptions of teachers with regard to their level of proficient in the use of basic computer operation ($x^2 = 13.273$, df = 2, $P<.001$) at the .001 level. Thus, teachers were statistically more likely to be very proficient in their use of basic computer operation.

Table 15. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Basic Computer Operations When Teaching African American Males

Basic Computer Operations	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	0	2	23	29	33
Percentage	0.0	6.1	36.4	57.6	100

x^2 = 13.273   df = 2   P = .001***   ***P<.001.

Teachers' Perceptions and Email Use

Table 16 represents the Chi-Square Test Goodness-of-Fit results regarding the perceptions of teachers toward their use of Email. A little over 12% of the teachers said they were somewhat proficient in the use of email as a use of instructional technology while 42.4% of them reported they were proficient in email use. In comparison, 45.5% of teachers expressed they were very proficient in the use of email use email as a technology implementation. Statistically significant differences were found in the perceptions of teachers regarding their level of proficient in the use of email at the .05 level (x^2 = 6.727, df = 2, P<.05). Accordingly, teachers were statistically more likely to be proficient or very proficient in the use of email as a use of instructional technology

Table 16. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Email When Teaching African American Males

Email Use	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	0	4	14	15	33
Percentage	0.0	12.1	42.4	45.4	100

$x^2 = 6.727$ df = 2 P = .035* *P<.05.

Teachers' Perceptions and Web Browser Operation and Internet

Illustrated in Table 17 are the Goodness-of-Fit Chi-Square results with regard to the perceptions of teachers toward the use of Web Browser Operation and Internet. Three percent of the teachers reported they were somewhat proficient in the use of Web Browser operation and Internet whereas 78.8% reported they were proficient in this type of instructional technology. On the other hand, 18.2% of the teachers indicated they were very proficient in the use of web browser operation and Internet. A statistically significant difference was found between the perceptions of teachers with regard to the use of the web browser operation and Internet (x^2 = 31.818, df = 2, P <.001) at the .001 level. Therefore, teachers were statistically more likely to be proficient in their level of use of web Browser operation and Internet.

Table 17. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Web Browser and Operation and Internet When Teaching African American Males

Web Browser Operation and Internet	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	0	1	26	6	33
Percentage	0.0	3.0	78.8	18.2	100

$x^2 = 31.818$ df = 2 P = .000*** ***P<.001.

Teachers' Perception and Information Searching

Revealed in Table 18 are the Goodness-of-Fit Chi-Square results with regard to the perceptions of the teachers toward the level of use of information searching as a use of instructional technology. Over 27% of the teachers reported they were somewhat proficient in the use of information searching, whereas 45.4% of teachers were proficient in this type of instructional technology. By contrast, 27.3% of the teachers reported they were very proficient in the use of information searching. No significant differences were found between the perceptions of teachers with regard to their level of use of information searching with the .05 level ($x^2 = 2.182$, df =2, P>.05).

Table 18. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Information Searching When Teaching African American Males

Information Searching	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	0	9	15	9	33
Percentage	0.0	27.3	45.4	27.3	100

$x^2 = 2.182$ df = 2 P = .336.

Teachers' Perceptions and Presentation Skills

Indicated in Table 19 are the one sample Chi-Square results pertaining to the perceptions of teachers regarding the level of use of presentation skills as a use of instructional technology. Three percent of the teachers reported they were not proficient in the use of presentation skills, while 33.3% of them said they were somewhat proficient in this type of technology implementation. In contrast, 27.3% of the teachers reported they were proficient whereas 36.4% expressed they were very proficient in the use of presentation skills as a use of instructional technology. A statistically significant difference was found between the perceptions of teachers with regard to their level of proficiency in the use of presentation skills. (x^2 = 9.061, df =3, P>.05) at the .05 level. Consequently, teachers were statistically more likely somewhat proficient or very proficient in the use of presentation skills.

Table 19. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Presentation Skills When Teaching African American Males

Presentation Skills	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	1	11	9	2	33
Percentage	3.0	33.3	27.3	36.4	100

x^2 = 9.061 df =3 P = .028* *P<.05.

Teachers' Perceptions and Word Processing

Table 20 revealed the Goodness-of-Fit Chi-Square fining regarding the perceptions of teachers toward their use of word processing as a use of instructional technology. Three percent of the teachers said they were not proficient in the use of word processing whereas 3% indicated they were somewhat proficient in the use of word processing. In comparison, 36.4% of the teachers reported they were proficient in the use of word processing and 57.6% said they were very proficient in the use of word processing as a use of instructional technology. Statistically significant differences were found between the perceptions of teachers toward word processing as a use of instructional technology (x^2 = 28.455, df =3, P>.000) at the .001 level. Therefore, teachers were statistically more likely to be very proficient in the use of word processing as a use of instructional technology.

Table 20. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Word Processing When Teaching African American Males

Word Processing	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	1	1	12	19	33
Percentage	3.0	3.0	36.4	57.6	100

x^2 = 28.455 df =3 P = .000*** ***P<.001.

Teachers' Perceptions and Spreadsheets

Enclosed in Table 21 are the Goodness-of-Fit Chi-Square results with regard to the perceptions of teachers toward the use of spreadsheets as a use of instructional technology. Over 6% of the teachers indicated they were not proficient in the use of spreadsheets while 27.3% said they were somewhat proficient in the use of spreadsheets. On the other hand, 42.4% reported they were very proficient in the use of spreadsheets as a use of instructional technology. A significant difference was found between the perceptions of teachers with regard to the use of spreadsheets (x^2 = 8.818, df =3, P>.05) at the .05 level. Accordingly, teachers were statistically more likely to be proficient in their level of use of spreadsheet as a use of instructional technology.

Table 21. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Spreadsheets When Teaching African American Males

Spreadsheets	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	2	11	9	2	33
Percentage	6.1	27.3	42.4	24.2	100

x^2 = 8.818 df =3 P = .032* *P<.05.

Teachers' Perceptions and Database

Revealed in Table 22 are the Chi-Square Goodness-of-Fit results with regard to the perceptions of teachers toward the level of use of database as a use of instructional technology. Over 9% of the teachers reported they were not proficient in their level of use of database whereas 45.4% indicated their level of use of database were somewhat proficient. Additionally, 39.4% of the teachers revealed that they were proficient in their level of use of database and 6.1% said they were very proficient in their level of use of database as a use of instructional. Statistically significant differences were found between the perceptions of teachers with respect to their level of use of database (x^2 = 16.333, df =3, P>.001) at the .001 level. Based on these findings, teachers were statistically more likely to be somewhat proficient or proficient in their level of use of database as a use of instructional technology.

Table 22. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Database When Teaching African American Males

Database	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	3	15	13	2	33
Percentage	9.1	45.4	39.4	6.1	100

x^2 = 16.333 df =3 P = .001*** *P<.001.

Teachers' Perceptions and Graphic Use

Table 23 revealed the Goodness-of-Fit Chi-Square findings regarding the perceptions of teachers toward their use of graphic use as a use of instructional technology. A little over 6% of the teachers said they were not proficient in their level of use in graphics while 24.2% of them reported they were somewhat proficient in their use of this type of technology. In addition, 51.5% of the teachers reported they were proficient in their level of use of graphics. A statistically significant difference was found between the perceptions of teachers (x^2 = 14.636, df =3, P>.001) with regard to the use of graphics as a use of instructional technology at the .001 level. Thus, teachers were statistically more likely to be proficient in their level of use of graphics as a use of instructional technology.

Table 23. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Graphic Use When Teaching African American Males

Graphic Use	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	2	8	17	6	33
Percentage	6.1	24.2	51.5	18.2	100

x^2 = 14.636 df =3 P = .022*** *P<.01.

Teachers' Perceptions and Ethical Use Understanding

Shown in Table 24 are the Chi-Square Goodness-of-Fit analyses regarding the perceptions of teachers toward their level of use of ethical understanding of the use of instructional technology. Three percent of the teachers reported they were not proficient in their level of use of ethical understanding with respect to technology implementation while 30.3% revealed they were somewhat proficient in their use of ethical understanding. By contrast, 36.4% of the teachers said they were proficient in their use of ethical understanding and 30.3% expressed they were very proficient in ethical understanding. A significant difference (x^2 = 8.181, df =3, P>.05) was found in the perceptions of teachers toward ethical understanding of technology implementation. Consequently, teachers were statistically more likely to be proficient in their level of use of ethical understanding of instructional technology.

Table 24. Chi-Square Results Regarding the Perceptions of Teachers in Their Level Use of Ethical Use Understanding When Teaching African American Males

Ethical Use Understanding	I am not at all prepared	I am somewhat prepared	I am well prepared	I am very well prepared	Total
Observed Frequencies	1	10	12	10	33
Percentage	3.0	30.3	36.4	30.3	100

x^2 = 8.818 df =3 P = .032*** *P<.05.

Research Question 3

What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?

Basic Computer Operation

To test the relationship between teachers' perceived level of use of basic computer operation as an instructional technology implementation and their students' academic performance in mathematics, an independent sample Chi-Square was employed. As shown in Table 25, a statistically significant relationship was found between teachers' perceived level of use of basic computer operation and their students' academic performance in mathematics (x^2 = 189.323, df =2, P>.001) at the .001 level. Further data analysis using the contingency correlation (c = .43) revealed that a high moderate relationship existed between teachers perceived level of use of basic computer operation and the math performance of their students.

Table 25. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Basic Computer Operation and the Academic Performance of Their African American Male Students in Mathematics

Basic Computer Operation		Met Standards	Did Not Meet Standards	Total
LEVEL 2	Number	10	88	98
	Percent	1.9	16.8	18.7
LEVEL 3	Number	112	58	170
	Percent	21.4	11.1	32.4
LEVEL 4	Number	186	70	256
	Percent	35.5	13.4	48.9
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 119.323; df = 2; C =.43; P = .000***; ***P<.001.

Email Use and Academic Performance

The two-sample Chi-Square was used to examine the relationship between the perceptions of teachers regarding the use of email as a use of instructional technology and the mathematics performance of their students. As indicated in Table 26, a significant relationship was found between the perceptions of teachers and their students' academic performance in mathematics (x^2 = 47.886, df =2, P>.001) at the .001 level. The Contingency Coefficient (C = .29) revealed that weak moderate relationship existed between teachers' perceptions regarding email as an instructional technology and the math performance of their students.

Table 26. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Email Use and the Academic Performance of Their African American Male Students in Mathematics

Email Use		Met Standards	Did Not Meet Standards	Total
LEVEL 2	Number	43	88	64
	Percent	8.2	4.0	12.2
LEVEL 3	Number	112	114	256
	Percent	21.4	27.5	48.9
LEVEL 4	Number	153	51	204
	Percent	29.2	9.7	38.9
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

$x^2 = 47.886$; df = 2; C =.29; P = .000***; ***P<.001

Web Browser Operation and Internet and Academic Performance

Presented in Table 27 was the Chi-Square results pertaining to the relationship between teachers' perceived level of use of the Web Browser Operation and Internet as an instructional technology and the mathematics performance of their students. A significant association ($x^2 = 25.213$, df =2, P>.001) was found between the perceptions of teachers and the math performance of their students at the .001 level. Additionally, the Contingency Correlation (C = .21) revealed a weak moderate relationship between the perceptions of teachers with respect to the level of use of the Web Browser Operation and Internet as a use of instructional technology and the academic performance of their students in mathematics.

Table 27. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Web Browser Operation and Internet and the Academic Performance of Their African American Students in Mathematics

Web Browser Operation and Internet		Met Standards	Did Not Meet Standards	Total
LEVEL 2	Number	10	7	17
	Percent	1.9	1.3	3.2
LEVEL 3	Number	230	196	426
	Percent	43.9	37.4	81.3
LEVEL 4	Number	68	13	81
	Percent	13.0	2.5	15.5
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 25.213; df = 2; C =.21; P = .000***; ***P<.001.

Information Searching and Academic Performance

Reported in Table 28 was the two-sample Chi-Square results regarding the relationship between the perceptions of teachers toward their level of use of information searching and their students' academic performance in mathematics. A significant relationship was found between the perceptions of teachers regarding information searching and their students' mathematics performance at the .001 level (x^2 = 60.036, df

=2, P>.001). Further data analysis using the Contingency Correlation (C = .32) revealed that a moderate relationship existed between the perceptions of teachers with regard to their level of use of information searching and the academic performance in mathematics.

Table 28. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Information Searching and the Academic Performance of Their African American Male Students in Mathematics

Information Searching		Met Standards	Did Not Meet Standards	Total
LEVEL 2	Number	79	123	202
	Percent	15.1	23.5	38.5
LEVEL 3	Number	140	73	213
	Percent	26.7	13.9	40.6
LEVEL 4	Number	89	20	109
	Percent	17.0	3.8	20.8
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 60.036; df = 2; C =.32; P = .000***; ***P<.001.

Presentation Skills and Academic Performance

A relationship was computed between the perceptions of teachers toward the level of use of presentation skills as an instructional technology and their students' academic performance in mathematics. As indicated in Table 29, a statistically significant relationship was found to exist between teachers perceived level of use of presentation skills and their students performance in mathematics (x^2 = 42.490, df =3, P>.001) at the .001 level. Further analysis employing the Contingency Correlation, (C = .27) revealed that weak moderate relationship was found between the perceptions of teachers with respect to their level of use of presentation skills and their students' academic performance in mathematics.

Table 29. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Presentation Skills and the Academic Performance of Their African American Students in Mathematics

Presentation Skills		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	4	1	5
	Percent	.8	.2	1.0
LEVEL 2	Number	84	117	201
	Percent	16.0	22.3	38.4
LEVEL 3	Number	113	62	175
	Percent	21.6	11.8	33.4
LEVEL 4	Number	107	36	143
	Percent	20.4	6.9	27.3
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 42.490; df = 3; C =.27; P = .000***; ***P<.001.

Word Processing and Academic Performance

Illustration in Table 30 was the Chi-Square of Independent Samples results pertaining to the relationship between the perceptions of teachers regarding their level of use of word processing and the academic performance of their students in mathematics. A significant relationship existed between the perceptions of teachers toward the level of use of word processing and their academic performance of mathematics (x^2 = 34.744, df =3, P>.001) at the .001 level. Furthermore, the Contingency correlation (C = .25) revealed a weak moderate relationship existed between the perceptions of teachers toward their level of use of word processing and the mathematics performance of their students.

Table 30. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Word Processing and the Academic Performance of Their African American Male Students in Mathematics

Word Processing		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	4	1	5
	Percent	.8	.2	1.0
LEVEL 2	Number	0	4	4
	Percent	0.0	.8	.8
LEVEL 3	Number	131	141	272
	Percent	25.0	26.9	51.9
LEVEL 4	Number	173	70	243
	Percent	33.0	13.4	46.4
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 =34.744; df = 3; C =.25; P = .000***; ***P<.001.

Spreadsheets and Academic Performance

Investigating the relationship between teachers' perceived level of use of spreadsheets as a use of instructional technology and their students' academic performance in mathematics, an independent sample of Chi-Square was used. As shown in Table 31, a statistically significant relationship was found between teachers' level of use of spreadsheets and their students' academic performance in mathematics (x^2 = 83.320, df =3, P>.001) at the .001 level. Additionally, the contingency coefficient (C = .37) revealed that high moderate relationship between the perceptions of teachers toward the level of use of spreadsheets as a use of instructional technology and their students' academic performance in mathematics.

Table 31. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Spreadsheets and the Academic Performance of Their African American Male Students in Mathematics

Spreadsheets		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	14	8	22
	Percent	2.7	1.5	4.2
LEVEL 2	Number	87	30	117
	Percent	16.6	5.7	22.3
LEVEL 3	Number	99	155	254
	Percent	18.9	29.6	48.5
LEVEL 4	Number	108	23	131
	Percent	20.6	4.4	25.0
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 83.320; df = 3; C =.37; P = .000***; ***P<.001.

Database and Academic Performance

A two-sample Independent Chi-Square test was computed to determine the relationship between was computed to determine the relationship between the perceptions of teachers toward their level use of database and their students' academic performance in mathematics. As reported Table 32 a significant existed between the perceptions of teachers (x^2 = 66.040, df =3, P>.001) with respect to their use of database and their students' academic performance in mathematics. Moreover, the Contingency Correlation (C = .34) found that a moderate relationship was found between the perceptions of teachers toward the use of database as an instructional technology and the mathematics performance of students.

Table 32. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Database and the Academic Performance of Their African American Male Students in Mathematics

Database		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	18	11	29
	Percent	3.4	2.1	5.5
LEVEL 2	Number	119	156	275
	Percent	22.7	29.8	52.5
LEVEL 3	Number	133	47	180
	Percent	25.4	9.0	34.4
LEVEL 4	Number	38	2	40
	Percent	7.3	.4	7.6
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 66.040; df = 3; C =.34; P = .000***; ***P<.001.

Graphics Use and Academic Performance

To determine the relationship between teachers' perceived level of use of graphics as a use of instructional technology and their students' academic performance in mathematics, an independent sample Chi-Square was employed. As revealed in Table 33, a significant relationship was found to exist between the perceptions of teachers (x^2 = 31.540, df =3, P>.001) regarding graphics as an instructional technology and their students' academic performance in mathematics (x^2 = 31.540, df =3, P>.001) at the .001 level. Further data analysis using the Contingency Coefficient (C = .24) reveled that a weak moderate relationship found between the teachers perceptions toward graphics as an instructional technology and their students' academic performance in mathematics.

Table 33. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in the Use of Graphics and the Academic Performance of Their African American Male Students in Mathematics

Graphics Use		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	14	8	22
	Percent	2.7	1.5	4.2
LEVEL 2	Number	63	39	102
	Percent	12.0	7.4	19.5
LEVEL 3	Number	165	158	323
	Percent	31.5	30.2	61.6
LEVEL 4	Number	66	11	77
	Percent	12.6	2.1	14.7
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 31.540; df = 3; C =..24; P = .000***; ***P<.001.

Ethical Use Understanding and Academic Performance

A Chi-Square of independent samples was computed to test the relationship between teachers' perceived level of use of ethical understanding of instructional technology and their students' academic performance in mathematics. As revealed in Table 34, a significant relationship was found between the perceptions of teachers and their students' academic performance in mathematics at the .001 level (x^2 = 48.158, df =3, P>.001). Further analysis utilizing the Contingency correlation (C = .29) revealed a weak moderate relationship existed between teachers' perceptions regarding their level of use of ethical understanding of instructional technology and their students' academic performance in math.

Table 34. Chi-Square Results Regarding the Relationship Between the Perceptions of Teachers in Ethical Use Understanding and the Academic Performance of Their African American Male Students in Mathematics

Ethical Use Understanding		Met Standards	Did Not Meet Standards	Total
LEVEL 1	Number	7	0	7
	Percent	1.3	0.0	1.3
LEVEL 2	Number	116	136	252
	Percent	22.1	26.0	48.1
LEVEL 3	Number	107	66	173
	Percent	20.4	12.6	33.0
LEVEL 4	Number	78	14	92
	Percent	14.9	2.7	17.6
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 48.158; df = 3; C =.29; P = .000***; ***P<.001.

Research Question 4

What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?

Computer Applications and Academic Performance

A Chi-Square of independent samples was calculated to measure the relationship between teachers' level of preparedness in computer applications and their students' academic performance. As shown in Table is 35, a statistically significant relationship existed between the teachers' level of preparedness in computer applications and their students' academic performance in mathematics (x^2 = 58.082, df =2, P<.001) at the .001 level. Furthermore, the contingency coefficient (C = .32) revealed a moderate relationship existed between the level of preparedness of teachers in computer applications and the academic performance in math of their students.

Table 35. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Computer Applications and the Academic Performance of Their African American Male Students in Mathematics

Computer Applications	Met Standards	Did Not Meet Standards	Total
Number	3	13	44
NOT PREPARED			
Percent	5.9	2.5	12.2
Number	119	144	256
SOMEWHAT PREPARED			
Percent	22.7	27.5	48.9
Number			
WELL PREPARED			
Percent			
Number	158	47	205

Table 35 (continued)

Computer Applications	Met Standards	Did Not Meet Standards	Total
VERY WELL PREPARED			
Percent	30.2	9.0	39.1
Number	308	216	524
TOTAL			
Percent	58.8	41.2	100.0

x^2 = 58.082; df = 2; C =.32; P = .000***; ***P<.001

Internet Correspondence and Academic Performance

To examine the relationship between teachers' level of preparedness in internet correspondence and their students' academic performance in math the independent sample Chi-Square was employed. As indicated in Table 36, a significant relationship (x^2 = 40.083, df =3, P<.001) was found to exist between teachers' preparedness in internet correspondence and the mathematics performance of their students at the .001 level. Additionally, the contingency correlation (C = .27) revealed that a weak moderate relationship was found between the level of preparedness of teachers in internet correspondence and the math performance of their students.

Table 36. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Internet Correspondence and the Academic Performance of Their African American Male Students in Mathematics

Internet Correspondence	Met Standards	Did Not Meet Standards	Total
Number	31	15	46
NOT PREPARED			
Percent	5.9	2.9	8.8
Number	100	74	174
SOMEWHAT PREPARED			
Percent	19.1	14.1	33.2

Table 36 (continued)

Internet Correspondence	Met Standards	Did Not Meet Standards	Total
Number	97	12	209
WELL PREPARED			
Percent	8.5	21.4	39.9
Number	80	15	95
VERY WELL PREPARED			
Percent	15.3	2.9	18.1
Number	308	216	524
TOTAL			
Percent	58.8	41.2	100.0

x^2 = 40.083; df = 3; C =.27; P = .000***; ***P<.001

Presentation Skills and Academic Performance

To test the relationship between the level of preparedness of teachers regarding presentation skills and the academic performance of their students in mathematics an independent sample of Chi-Square was utilized. As reported in Table 37, a statistically association was found between teachers' preparedness in presentation skills and their students' academic performance in mathematics at the .001 level (x^2 = 40.693, df =3, P<.001). In addition, the contingency correlation (C=.27) revealed a weak moderate relationship between teachers' preparedness in presentation skills and the mathematics performance of their students.

Table 37. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Presentation Skills and the Academic Performance of Their African American Male Students in Mathematics

Presentation Skills		Met Standards	Did Not Meet Standards	Total
NOT PREPARED	Number	15	10	25
	Percent	2.9	1.9	4.8
SOMEWHAT PREPARED	Number	51	41	92
	Percent	9.7	7.8	17.6
WELL PREPARED	Number	125	136	261
	Percent	23.9	26.0	49.8
VERY WELL PREPARED	Number	117	29	146
	Percent	22.3	5.5	27.9
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 40.693; df = 3; C =.27; P = .000***; ***P<.001

Information Searching and Academic Performance

Presented in Table 38 are the Independent Sample Chi-Square results pertaining to the level of preparedness of teachers in information searching and their students' academic performance in mathematics. A statistically significant correlation was found between the level of preparedness of teachers in information searching and their students' academic performance in mathematics at the .001 level (x^2 = 61.040, df =3, P<.001). Further data analysis using the contingency coefficient (C = .32) reported a moderate relationship between teachers' preparedness in information searching and their students' academic performance in mathematics.

Table 38. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Information Searching and the Academic Performance of Their African American Male Students in Mathematics

Information Searching		Met Standards	Did Not Meet Standards	Total
NOT PREPARED	Number	15	10	25
	Percent	5.9	1.9	4.8
SOMEWHAT PREPARED	Number	61	34	95
	Percent	11.6	6.5	18.1
WELL PREPARED	Number	114	148	262
	Percent	21.8	28.2	50.0
VERY WELL PREPARED	Number	118	24	142
	Percent	22.5	4.6	27.1
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

x^2 = 61.040; df = 3; C =.32; P = .000***; ***P<.001.

Practice Drills and Academic Performance

Reported in Table 39 are the Chi-Square of independence findings regarding the relationship between teachers' level of preparedness in practice drills and their students' academic performance in mathematics. A significant association was found between the level of preparedness of teachers in practice drills (x^2 = 59.476 df =3, P<.001) and their students' academic performance mathematics Moreover, the contingency correlation (C = .32) revealed that moderate relationship existed between teachers' level of preparedness in practice drills and their students performance in math.

Table 39. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Practice Drills and the Academic Performance of Their African American Male Students in Mathematics

Practice Drills	Met Standards	Did Not Meet Standards	Total
Number	23	13	36
NOT PREPARED			
Percent	4.4	2.5	6.9
Number	23	42	6
SOMEWHAT PREPARED			
Percent	4.4	8.0	12.4
Number	119	125	244
WELL PREPARED			
Percent	22.7	23.9	46.6
Number	143	36	179
VERY WELL PREPARED			
Percent	27.3	6.9	34.1
Number	308	216	524
TOTAL			
Percent	58.8	41.2	100.0

x^2 = 59.476; df = 3; C =.32; P = .000***; ***P<.001.

Classroom Instruction and Academic Performance

Indicated in Table 40 are the interdependent sample Chi-Square test with regard to the teachers' level of preparedness in classroom instructional and their students' academic performance in mathematics. A significant relationship was found between the level of preparedness of teachers and the math performance of their students at the .001 level (x^2 = 54.52359.476 df =3, P<.001). Further data analysis using the contingency coefficient (C = .31) revealed that a moderate relationship existed between teachers' level of preparedness in classroom instruction and their students' academic performance in mathematics.

Table 40. Chi-Square Results Regarding the Relationship Between the Level of Preparedness of Teachers in the Use of Classroom Instruction and the Academic Performance of Their African American Male Students in Mathematics

Classroom Instruction		Met Standards	Did Not Meet Standards	Total
NOT PREPARED	Number	15	10	25
	Percent	2.9	1.9	4.8
SOMEWHAT PREPARED	Number	74	54	128
	Percent	14.1	10.3	24.4
WELL PREPARED	Number	93	123	216
	Percent	17.7	23.5	41.2
VERY WELL PREPARED	Number	126	29	155
	Percent	24.0	5.5	29.6
TOTAL	Number	308	216	524
	Percent	58.8	41.2	100.0

$x^2 = 54.523$; df = 3; C =.31; P = .000***; ***P<.001.

Research Question 5

What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students in mathematics?

Direct (standard) logistic regression and conducted to determine which independent variables (teachers' level of preparedness and teachers' perceived level of use of instructional technology) were predictors of students' academic performance. Regression results indicated the overall made of two predictors (level of preparedness and level of use of instructional technology) was statistically reliable in distinguishing between met standard and did not meet standard. (-z Log Likelihood = 532.689, Chi-Square = 177.492; df = 16, P <.001 (see Table 41).

With regard to Cox and Snell, 29% of the variance in students' academic performance can be explained by teachers' level of preparedness and teachers' perceived level of use of instructional technology (see Table 42). Prediction of academic performance was impressive regarding the students meeting the standard in mathematics but not in terms of students not meeting standard in mathematics with 93.2 of the teachers correctly predicted meeting standard and 54.2% in reference to not meeting standard, for an overall academic performance of 77.1% (see Table 43).

Moreover, according the Wald Criterion (see Table 41) of all the predictors with regard teachers' preparedness, basic computer operation and spreadsheet had the most predictive power regarding students' academic performance in math. On the other hand, of all the predictors with respect to teachers' perceptions regarding the use of instructional technology, practice drills and classroom instruction had the most predictive power toward students' academic performance in math. However, odd ratios for the aforementioned independent variables indicated little change in the likelihood of students' academic performance in math (see Table 41).

Table 41. Regression Coefficients Regarding the Relationship Between Teachers' Level of Preparedness, Teachers' Perceived Level of Use Instructional Technology and Their African American Male Students' Academic Performance in Mathematics

Variable	B	S.E.	Wald	df	P	Exp (B)
Preparedness						
Basic Computer Operation	-1.473	.333	19.588	1	.000***	.229
Email Use	- .282	.212	1.527	1	.217	.770
Internet	-.985	.685	2.067	1	.151	2.679
Information Searching	-.792	.403	3.868	1	.049*	.453
Presentation Skills	.702	.420	2.790	1	.095	2.017
Word Processing	.709	.352	4.056	1	.044*	2.033
Spreadsheet	-.887	.344	6.631	1	.010**	.412
Database	-.428	.299	2.051	1	.152	.651
Graphics Use	.518	.283	3.343	1	.067	1.679
Ethical Use Understanding	-.807	.320	6.364	1	.012*	.446
Perception						
Computer Applications	-.327	.406	.649	1	.420	.721
Internet Correspondence	.696	.309	5.062	1	.024*	2.005
Presentation Skills	.321	.358	.806	1	.369	1.379
Information Searching	.778	.367	4.508	1	.034*	2.178
Practice Drills	.923	.218	17.937	1	.000***	.347
Classroom Instruction	-.979	.366	7.171	1	.007**	.376
Constant	5.644	1.759	10.292	1	.001	282.659

Table 42. Overall Model Fit Result

Model	B	-2 Log Likelihood	Chi-Square	df	P
Intercept	-.355				
Final		533.689	177.492	16	.000***

x^2 = 177.492; df = 16; P = .000*** Cox and Snell = .287

Table 43. Classification Table Results

Academic Performance	Met Standards	Did Not Meet Standards	Percent Correct
Met Standards	287	21	93.2
Di Not Meet Standards	99	117	54.2

Note. Overall Correct = 77.1.

Research Question 6

What is the relationship between the activities teachers use in teaching mathematics objectives and how effective are these activities in teaching mathematics to African American male students?

The Pearson product moment correlation was used to compute the relationship between activities used by teachers in teaching mathematics objectives and the effectiveness of these activities in teaching mathematics objectives (Table 44). All 12 activities used by teachers and their effectiveness in teaching mathematics objectives were found to be statistically related. The highest positive relationship was found with regard to the activities of simulation, spreadsheets, word processing, multimedia presentation (teacher) and computers for drill and practice. Thus, the more teachers use the twelve activities in teaching mathematics objectives the more they perceive them to be effective.

Table 44. Pearson Product Moment Correlation Results Regarding Activities Used by Teachers in Teaching Mathematics Objectives to African American Male Students and Their Effectiveness

Activities	r	df	r^2	P
1. Internet (Teacher)	.523	90	.274	.000***
2. Internet (Student)	.853	90	.728	.000***
3. Presentation Software (Teacher)	.899	90	.808	.000***
4. Presentation Software (Student)	.863	90	.745	.000***
5. Multimedia Presentation (Teacher)	.936	90	.876	.000***
6. Multimedia Presentation (Student)	.661	90	.437	.000***
7. Computers for Communication (asynchronous)	.810	90	.656	.000***
8. Computers for Communication (synchronous)	.610	90	.372	.000***
9. Computers for drill and practice	.908	90	.824	.000***
10. Spreadsheets	.935	90	.874	.000***
11. Word Processing	.926	90	.857	.000***
12. Simulation (Computer-based)	.969	90	.939	.000***

*** P <.001.

Additional Data Analysis

Statistically significant relationships were found between level of proficiency and use of instructional technology as well as between level of preparedness and use of instructional technology with regard to African American male middle school students meeting or not meeting the standards on the mathematics section of the TAKS. Since significant relationships were found between level of proficiency, level of preparedness, and the various types of instructional technology strategies used by teachers, for further data analysis using cross tabulations were done to identify what grade level was the teachers more likely to be proficient and prepare to use these technology strategies.

Level of Proficiency

Grade Level and Basic Computer Operation

Presented in Table 45 were the crosstab results pertaining to the levels of proficiency in the use of basic computer operation by teachers with regard to grade level. Seven out of twelve seventh grade teachers, 6 out of 12 sixth grade teachers and 3 out of 6 eighth grade teachers reported they were very proficient in the use of basic computer operation as an instructional technology. Of the overall teachers who participated in the study, 21.2% who taught 7th grade and 18.2% and 18.2%, respectively, who taught the 6th and 8th grades reported they were very proficient in the use of this technology.

Table 45. Crosstabs Results Regarding Relationship Between Grade Level and Use of Basic Computer Operation to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	2	4	6	12
6^{th} Grade					
Percent	0.0	6.1	12.1	18.2	36.4
Number	0	0	5	7	12
7^{th} Grade					
Percent	0.0	0.0	15.2	21.2	36.4
Number	0	0	3	6	9
8^{th} Grade					
Percent	0.0	0.0	9.1	18.2	27.3
Number	0	2	12	19	33
Total					
Percent	0.0	6.1	36.4	57.6	100.0

Grade Level and Email Use

Illustrated in Table 46 were the cross tabulation analyses with regard to middle school teachers' levels of proficiency in the use of email as an instructional technology strategy by grade level. Among the 8^{th} grade teachers who participated in the study, 5 out of 9 reported they were very proficient in the use of email. Among the 7^{th} graders, 6 out of 12 were very proficient and 4 out of 12 6^{th} grade teachers indicated they were very proficient in the use of email as an instructional technology strategy. Overall, 18.2% of the teachers who taught 7^{th} grade, 15.2 and 12.1, respectively, who taught 8^{th} and 6^{th} grades reported they were very proficient in the use of this instructional technology.

Table 46. Crosstabs Results Regarding Relationship Between Grade Level and Email Use to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	2	6	4	12
6th Grade					
Percent	0.0	6.1	18.2	12.1	36.4
Number	0	1	5	6	12
7th Grade					
Percent	0.0	3.0	15.2	18.2	36.4
Number	0	1	3	5	9
8th Grade					
Percent	0.0	3.0	9.1	15.2	27.3
Number	0	4	14	15	33
Total					
Percent	0.0	12.1	42.4	45.4	100.0

Grade Level and Web Browser Operation and Internet

Cross tab analyses were used to determine the influence of grade level of middle school teachers on their use of web browser operation and internet as an instructional technology strategy. Shown in Table 47, when examining the frequencies of the number of teachers and their level of proficiency in the use of web browser operation and internet as an instructional technology strategy, 10 out of 12 seventh grade, 7 out of 9 eighth grade and 9 out of 12 sixth grade teachers revealed they were proficient in the use of this technology strategy. On the overall teacher group, 30.3%, 27.3% and 21.2% respectively, of those who taught 7th, 6th, and 8th grade felt this way.

Table 47. Crosstabs Results Regarding Relationship Between Grade Level and Use of Web Browser Operation and Internet to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	1	9	2	12
6th Grade					
Percent	0.0	3.0	27.3	6.1	36.4
Number	0	0	10	2	12
7th Grade					
Percent	0.0	0.0	30.3	6.1	36.4
Number	0	0	7	2	9
8th Grade					
Percent	0.0	0.0	21.2	6.1	27.3
Number	0	2	12	19	33
Total					
Percent	0.0	3.0	78.8	18.2	100.0

Grade Level and Information Searching

The cross tabulation results concerning the influence of grade level on the use of information searching as an instructional technology strategy by middle school teachers were presented in Table 48. Six out of 12 6th grade teachers, 5 out of 12 7th grade teachers and 4 out of 9 8th grade teachers indicated they were proficient in the use of information searching as an instructional technology strategy. Based on the total teacher group, 18.2% of those who taught the 6th grade, as compared to 15.2% and 6.1% respectively, who taught the 7th and 8th grades, expressed that they were proficient in the use of information searching.

Table 48. Crosstabs Results Regarding Relationship Between Grade Level and Use of Information Searching to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	4	6	2	12
6th Grade					
Percent	0.0	12.1	18.2	6.1	36.4
Number	0	3	5	4	12
7th Grade					
Percent	0.0	9.1	15.2	12.1	36.4
Number	0	2	4	3	9
8th Grade					
Percent	0.0	6.1	12.1	9.1	27.3
Number	0	9	15	9	33
Total					
Percent	0.0	27.3	45.5	27.3	100.0

Grade Level and Presentation Skills

Shown in Table 49 were cross tab findings regarding the use of presentation skills as an instructional technology strategy by middle school teachers with respect to their grade level. Fifty-six percent (5 out of 12) of the 8th grade teachers revealed they were very proficient in the use of presentation skills, as compared to 33.3% (4 out of 12) and 25% (3 out of 9) of 7th and 6th grade teachers, consecutively. Overall, 15.2% of teachers who taught 8th grade, as compared to 12.1% and 9.1%, respectively, who taught 7th and 6th grades reported they were very proficient in using presentation skills as an instructional technology strategy.

Table 49. Crosstabs Results Regarding Relationship Between Grade Level and Use of Presentation Skills to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	4	5	3	12
6th Grade					
Percent	0.0	12.1	15.2	9.1	36.4
Number	1	5	2	4	12
7th Grade					
Percent	3.0	15.2	6.1	12.1	36.4
Number	0	2	2	5	9
8th Grade					
Percent	0.0	6.1	6.1	15.2	27.3
Number	1	11	9	12	33
Total					
Percent	3.0	33.3	27.3	36.4	100.0

Grade Level and Word Processing

Reported in Table 50 were the cross tabulation results pertaining to the influences of grade level on the level of proficiency of middle school teachers on their utilization of word processing as an instructional technology strategy. Among 8th grade teachers, 7 out of 9 compared with 6 out of 12 for 6th and 7th grade teachers, respectively, indicated they were very proficient in the use of word processing as an instructional technology strategy. In additional, 21.2%, 18.2%, and 18.2%, respectively, of 8th, 7th, and 6th grade teachers were similar in their use of this instructional technology strategy when compared as a group.

Table 50. Crosstabs Results Regarding Relationship Between Grade Level and Use of Word Processing to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	0	6	6	12
6^{th} Grade					
Percent	0.0	0.0	18.2	18.2	36.4
Number	1	1	4	6	12
7^{th} Grade					
Percent	3.0	3.0	12.1	18.1	36.4
Number	0	0	2	7	9
8^{th} Grade					
Percent	0.0	0.0	6.1	21.2	27.3
Number	1	1	12	19	33
Total					
Percent	3.0	3.0	36.4	57.6	100.0

Grade Level and Spreadsheets

Revealed in Table 51 were the cross tab analyses regarding the use of spreadsheets as an instructional technology strategy by middle school teachers with respect to their grade levels. Seven out of 12 of the 7^{th} grade teachers reported they were proficient in the use of spreadsheet as an instructional technology strategy, as compared to 5 out of 12 of the 6^{th} grade teachers and 2 out of 9 of the 8^{th} grade teachers. Moreover, when the overall teacher group was compared, 21.2% of teachers who taught 7^{th} grade, as compared to 15.2% and 6.1% of teachers who taught 6^{th} and 8^{th} grades felt in similar manner regarding spreadsheet as an instructional technology strategy.

Table 51. Crosstabs Results Regarding Relationship Between Grade Level and Use of Spreadsheets to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	3	5	3	12
6^{th} Grade					
Percent	3.0	9.1	15.2	9.1	36.4
Number	1	3	7	1	12
7^{th} Grade					
Percent	3.0	9.1	21.2	3.0	36.4
Number	0	3	2	4	9
8^{th} Grade					
Percent	0.0	9.1	6.1	12.1	27.3
Number	2	9	14	8	33
Total					
Percent	6.1	27.3	42.4	24.2	100.0

Grade Level and Database

Cross tabulations were presented in Table 52 to determine the influence of grade level on middle school teachers' use of database as an instructional technology strategy. Six out of 12 of the 6^{th} grade teachers compared with 5 out of 12 of the 7^{th} grade teachers and 4 out of 9 of the 8^{th} grade teachers reported they were somewhat proficient in the use of database as in instructional technology strategy. Furthermore, when the overall teacher group was considered, 18.2% of the teachers who taught 8^{th} grade indicated they were somewhat proficient in the use of database as in instructional technology strategy, as compared to 15.2% and 12.1%, respectively, or those who taught 7^{th} and 8^{th} grades.

Table 52. Crosstabs Results Regarding Relationship Between Grade Level and Use of Database to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	2	6	3	1	12
6^{th} Grade					
Percent	6.1	18.2	9.0	3.0	36.4
Number	1	5	5	1	12
7^{th} Grade					
Percent	3.0	15.2	15.2	3.0	36.4
Number	0	4	5	0	9
8^{th} Grade					
Percent	0.0	12.1	15.2	0.0	27.3
Number	3	15	13	2	33
Total					
Percent	7.1	45.5	39.4	6.1	100.0

Graphic Level and Graphic Use

Enclosed in Table 53 were the cross tabulation results with respect to the utilization of graphic use on the part of middle school teachers as an instructional technology strategy across grade level. Both in grades 6^{th} and 7^{th}, 7 out of 12 middle school teachers reported they were proficient in the utilization of graphic use as an instructional technology strategy, as compared to 3 out of 9 for 8^{th} grade teachers. Further, when the total group of teachers was taken into account, 21.2% of those who taught on the 6^{th} and 7^{th} grade level said they were proficient in the utilization of graphic use as an instructional technology strategy. On the other hand, only 9.1% of teachers who taught on the 8^{th} grade level reported similar results.

Table 53. Crosstabs Results Regarding Relationship Between Grade Level and Graphic Use to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	2	7	2	12
6^{th} Grade					
Percent	3.0	6.1	21.2	6.1	36.4
Number	1	2	7	2	12
7^{th} Grade					
Percent	3.0	6.1	21.2	6.1	36.4
Number	0	4	3	2	9
8^{th} Grade					
Percent	0.0	12.1	9.1	6.1	27.3
Number	2	8	17	6	33
Total					
Percent	6.1	24.2	51.5	18.2	100.0

Grade Level and Ethical Use Understanding

Middle school teachers' ethical understanding in the use of instructional technology strategies was investigated with regard to grade level. As shown in Table 54, 56% (5 out of 9) of 8^{th} grade teachers reported they were proficient in their ethical understanding of instructional technology strategies, as compared to 41.7% (5 out of 12) and 16.7% (2 out of 12) of 7^{th} and 6^{th} grade teachers, respectively. Additionally, when the overall group of teachers was considered, 15.2%, 15.2% and 6.1% of 8^{th}, 7^{th} and 6^{th}, respectively, who taught the aforementioned grades revealed they were proficient in the ethical understanding of instructional technology strategies.

Table 54. Crosstabs Results Regarding Relationship Between Grade Level and Ethical Use Understanding to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	0	8	2	2	12
6th Grade					
Percent	0.0	24.2	6.1	6.1	36.4
Number	1	2	5	4	12
7th Grade					
Percent	3.0	6.1	15.2	12.1	36.4
Number	0	0	5	4	9
8th Grade					
Percent	0.0	0.0	15.2	12.1	27.3
Number	1	10	12	10	33
Total					
Percent	3.0	30.3	36.4	30.3	100.0

Level of Preparedness

Grade Level and Computer Application

Reported in Table 55 were the cross tabulation results pertaining to the level of preparedness in the use of computer application by middle school teachers across grade level. Five out of 9 eighth grade, 4 out of 12 seventh grade and 5 out of 12 sixth grade teachers expressed they were very well prepared in the use of computer application as an instructional technology tool. In contrast, 3 out of 9 eighth grade teachers, 6 out of 12 seventh and eighth grade teachers revealed they were somewhat prepared in the use of this instructional technology strategy. Moreover, when the total teacher sample was taken into consideration, 15.2% (18.2% somewhat) of the teachers who taught 6th and 7th grade, respectively, felt this way. Only 12.1% (9.1% somewhat) of the teachers who taught 8th grade indicated similar results.

Table 55. Crosstabs Results Regarding Relationship Between Grade Level and Use of Computer Application to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	6	0	5	12
6th Grade					
Percent	3.0	18.2	0.0	15.2	36.4
Number	2	6	0	4	12
7th Grade					
Percent	6.1	18.2	0.0	12.1	36.4
Number	1	3	0	5	9
8th Grade					
Percent	3.0	9.1	0.0	15.2	27.3
Number	4	15	0	14	33
Total					
Percent	12.1	45.5	0.0	42.5	100.0

Grade Level and Internet Application

Revealed in Table 56 were the cross tab analyses with regard to middle school teachers' level of preparedness in the use of Internet application as an instructional technology strategy. Among 6th grade teachers, 3 out of 12 reported they were well prepared in the use of internet application; however, in the same grade 5 out of 12 said they were somewhat prepared in the use of this instructional technology strategy.

Table 56. Crosstabs Results Regarding Relationship Between Grade Level and Use of Internet Application to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	2	4	5	12
6th Grade					
Percent	3.0	6.1	12.1	15.2	36.4
Number	1	4	2	5	12
7th Grade					
Percent	3.0	12.1	6.1	15.2	36.4
Number	0	1	6	2	9
8th Grade					
Percent	0.0	3.0	18.2	6.1	27.3
Number	2	7	12	12	33
Total					
Percent	6.1	21.1	36.4	36.4	100.0

Additionally, among 7th grade teachers, 4 out of 12 indicated they were well prepared in the use of the internet application whereas on the same grade level 3 out of 12 expressed they were somewhat prepared in the use of internet application. In addition, among 8th grade teachers, 4 out of 9 revealed they were well prepared in the use of internet application as in instructional technology strategy. Nonetheless, 3 out of 9 on the same grade level said they were somewhat prepared in the use of internet application.

Grade Level and Presentation Skills

Cross tabulation analyses (see Table 57) were used to examine the effect of grade level on the utilization of middle school teachers toward presentation skills as an instructional technology strategy. Eight out of nine 8th grade teachers reported they were well prepared or very well prepared in the use of presentation skills as an instructional technology strategy. On the other hand, 9 out of 12 of the 6^{th} grade teachers indicated they were well prepared or very well prepared in their use of presentation skills as in instructional tool.

Moreover, 7 out of 12 7^{th} grade teachers said they were well prepared or very well prepared in their use of presentation skills as an instructional technology strategy. Finally, when the total teacher sample was analyzed, 27.3% of the teachers who taught 6^{th} grade, as compared to 24.3% who taught 8^{th} grade and 21.3% who taught 7^{th} grade, reported similar results.

Table 57. Crosstabs Results Regarding Relationship Between Grade Level and Use of Presentation Skills to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	2	4	5	12
6^{th} Grade					
Percent	3.0	6.1	12.2	15.1	36.4
Number	1	4	2	5	12
7^{th} Grade					
Percent	3.0	12.1	6.1	15.1	36.4
Number	0	1	6	2	9
8^{th} Grade					
Percent	0.0	3.0	18.2	6.1	27.3
Number	2	7	12	12	33
Total					
Percent	6.1	21.2	36.4	36.4	100.0

Grade Level and Information Searching

Shown in Table 58 were cross tab findings regarding the use of information searching as an instructional technology strategy by middle school teachers with respect to their grade level. Eight out of 12 sixth grade teachers indicated they were well prepared or very well prepared in the use of information searching as an instructional technology strategy.

Table 58. Crosstabs Results Regarding Relationship Between Grade Level and Use of Information Searching to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	3	5	3	12
6th Grade					
Percent	3.0	9.1	15.2	9.1	36.4
Number	1	1	4	6	12
7th Grade					
Percent	3.0	3.0	12.1	18.2	36.4
Number	0	2	4	3	9
8th Grade					
Percent	0.0	6.1	12.1	9.1	27.3
Number	2	6	13	12	33
Total					
Percent	6.1	18.2	39.4	36.4	100.0

Furthermore, 10 out of 12 seventh grade teachers, as compared to 7 out of 9 eighth grade teachers, reported the utilization of information searching as an instructional technology strategy. When the overall teacher group was considered, 24.3%, 30.3% and 21.2% of teachers who taught the 6th, 7th, and 8th grades, respectively, reported the use of information searching as an instructional tool.

Grade Level and Practice Drills

Illustrated in Table 59 were the cross tabulation results concerning the impact of grade level on the level of preparedness of middle school teachers on their utilization of practice drills as an instructional technology strategy. Among 6th grade teachers, 10 out of 12 said they were well prepared or very well prepared in the use of practice drills as an instructional technology tool.

Table 59. Crosstabs Results Regarding Relationship Between Grade Level and Use of Practice Drills to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	2	0	4	6	12
6th Grade					
Percent	6.1	0.0	12.1	18.2	36.4
Number	1	3	4	4	12
7th Grade					
Percent	3.0	9.1	12.1	12.1	36.4
Number	0	1	5	3	9
8th Grade					
Percent	0.0	3.0	15.2	9.1	27.3
Number	3	4	13	13	33
Total					
Percent	9.1	12.1	39.4	39.4	100.0

Moreover, among 7^{th} grade teachers, 8 out of 12 reported they were well prepared or very well prepared in the use of practice drills as an instructional technology strategy. In comparison, 8 out of 9 eighth grade teachers expressed they were well prepared or very well prepared in their utilization of practice drills as an instructional tool. Finally, when overall teacher group was examined, 30.3%, 24.2%, and 24.3% of teachers who taught 6^{th}, 7^{th} and 8^{th} grade, respectively, reported similar results pertaining to their use of practice drills as an instructional technology strategy.

Grade Level and Classroom Instruction

Presented in Table 60 were the cross tab analyses regarding the use of classroom instruction as a technology strategy by middle school teachers with reference to grade level. Seventy-five percent (9 out of 12) of the 6^{th} grade teachers, as compared to 58.3% (7 out of 12) of 7^{th} teachers and 66.6% (6 out of 9) of 8^{th} grade teachers reported they were well prepared or very well prepared in the use of classroom instruction as a technology strategy.

Finally, analyzing the overall teacher group, 27.3%, 21.2% and 18.2% of teachers who taught 6^{th}, 7^{th}, and 8^{th} grades, respectively, reported they were well prepared or very well prepared in the use of classroom instruction as a technology strategy.

Table 60. Crosstabs Results Regarding Relationship Between Grade Level and Use of Classroom Instruction to Teach African American Males Mathematics

Grade Level	Not Proficient	Somewhat Proficient	Proficient	Very Proficient	Total
Number	1	2	3	6	12
6th Grade					
Percent	3.0	6.1	9.1	18.2	36.4
Number	1	4	3	4	12
7th Grade					
Percent	3.0	12.1	9.1	12.1	36.4
Number	0	3	4	2	9
8th Grade					
Percent	0.0	9.1	12.1	6.1	27.3
Number	2	9	10	12	33
Total					
Percent	6.1	27.3	30.3	36.4	100.0

Summary

In this chapter, the findings of the current study are reported. The study yields a significant amount of data that reveals teachers' preparation and level of use of technology in their respective math courses. Respectively, the study yields significant results regarding the relationship of teachers' preparation and use of instructional technology and student academic achievement in math.

Consistent with the research of Loucks-Horsley (2000) and Haycock (2001), teachers revealed that they were prepared to use and implement technology in the classroom in the current study. Additionally, teachers perceived that they were proficient on 70% of the computer applications used to provide instruction in the classroom. These findings were supported by those of Lovelace (2005). The current study also revealed a positive relationship between teacher perceptions and preparedness and the mathematics performance of their students. These findings parallel those of Swain and Pearson (2003).

The population sampled for the current study consisted of 33 6th, 7th, and 8th grade teachers employed in an urban school district located in the southern region of Texas. The data for this study were collected from a survey entitled, “Middle School Students’ Mathematics Teacher Survey.” Moreover, the data were tested through the application of the Chi-Square Goodness-of-Fit, Logistics Regression, and the Pearson Product Moment Correlation. For this empirical study, data gathered regarding the research questions were tested at the .05 significance level or better. The following chapter will give more details and discussion of the findings that were observed from the results of this study.

CHAPTER V

DISCUSSION, CONCLUSIONS, AND SUMMARY

There is a wide achievement gap in mathematics today in America's schools with respect to African American students. Data from the NAEP suggest that many students of color are not being exposed to the instructional practices that are suggested by the National Council of Teachers of Mathematics (NCTM, 2000). Research indicates that teacher perceptions and expectations have a significant impact on students' grades and performance on standardized mathematics assessments. Teachers form different expectations and perceptions of students when considering race, gender, and social status. Osborne (1999) strongly believes that the actions of school districts, schools, and individual teachers have the power to reverse negative trends and reinforces academic achievement orientation in African American students.

According to Sankofa et al. (2005), African American students will perform better academically in a classroom that matches their learning style. The strongest preference for a kinesthetic learning style was from African American students (Ewing & Yong, 1992). CRT teaching must be brought to the classroom which places emphasis on cultural preferences in relation to teaching and learning (Gay, 2010). Teacher use of technology has the potential to meet the conditions of a kinesthetic learner, provided the teacher utilizes the computer to create stimulating learning experiences (Swain & Pearson, 2003).

The current study examined whether African American male students' academic achievement level in mathematics can be positively impacted by teachers' use of instructional technology. Additionally, this study investigated teachers' level of preparedness in the use of technology implementation as well as their perceptions regarding their level of use of technology implementation. Finally, this study ascertained the relationship between the use of activities by teachers to teach mathematics objectives and how effective they felt these activities were in teaching mathematics to African American males.

The population consisted of 33 6th, 7th, and 8th grade teachers employed in an urban school district located in the southern region of Texas. The data for this study were collected from a survey entitled, "Middle School Students' Mathematics Teacher Survey." Moreover, the data were tested through the application of the Chi-Square Goodness-of-Fit, Logistics Regression, and the Pearson Product Moment Correlation. For this empirical study, data gathered regarding the research questions were tested at the .05 significance level or better.

Research Questions

1. What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?
2. What are the teachers' perceptions of their level of use of instructional technology when teaching math objectives to African American males?
3. What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?

4. What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?
5. What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students in mathematics?
6. What is the relationship between the activities teachers use in teaching mathematics objectives and how effective are these activities in teaching mathematics to African American male students?

Discussion and Results

The first question addressed the level of preparedness in the use of instructional technology. *What are the teachers' levels of preparedness in the use of instructional technology when teaching math objectives to African American males?* Teachers were statistically significantly more likely to be very well prepared in the use of computer applications, presentation skills, information searching, and practice drills as instructional technology. Teachers were not statistically more prepared in the use of internet correspondence and classroom instruction as a use of instructional technology.

The second question addressed the teachers' perceptions of their level of use of instructional technology. *What are the teachers' perceptions of their level of use of instructional technology when teaching math objectives to African American males?* Teachers were statistically more likely to be very proficient in their use of basic computer operation, application, word processing, and spreadsheet as a use of instructional technology. Teachers were also statistically more proficient or very proficient in their use of email and web browser operation and internet, as a use of instructional technology. Teachers were not statistically proficient in their use of information searching as a use of instructional technology. Teachers were statistically more likely to be somewhat proficient or very proficient in the use of presentation skills and database as a use of instructional technology. Teachers were statistically more likely to be proficient in the use of graphics and ethical understanding of the use of instructional technology.

The third question addressed the relationship between teachers' perceived level of use of instructional technology and their students' academic performance in math. *What is the relationship between the teachers' perceived level of use of instructional technology and their African American male students' academic performance in mathematics?* A high moderate relationship was found between the math performance of students and their teachers' perceived level of use of basic computer operation and spreadsheet as a use of instructional technology. A weak moderate relationship was found between the math performance of students and their teachers perceived level of use of email, web browser operation, presentation skills, word processing, graphics, and ethical understanding of technology as a use of instructional technology. A moderate relationship was found between the math performance of students and their teachers' perceived level of use of information searching and database as use of instructional technology.

The fourth question addressed the relationship between the teachers' perceived level of preparedness in the use of instructional technology and their students' academic performance in mathematics. *What is the relationship between the teachers' level of preparedness in the use of instructional technology and their African American male students' academic performance in mathematics?* A moderate relationship was found between the math performance of African American male students and their teachers' preparedness in the use of information searching, practice drills, and classroom instruction. A weak relationship was found between the math performances of African American male students' and their preparedness in the use of internet correspondence and presentation skills.

The fifth question addresses the predictive power of teachers' level of preparedness and teachers' perceived level of use of instructional technology on the academic performance of African American male students. *What is the comparative predictive power of the variables teachers' level of preparedness and teachers' perceived level of use instructional technology on the academic performance of African American male students in mathematics?* The variables teachers' level of preparedness in technology and their perceptions regarding the use and implementation of technology in the classroom were reliable predictors of African American male students meeting the standards in mathematics. Teachers' preparedness in the use of basic computer operations and spreadsheets had the most predictive power regarding African American male students' academic performance in math. Teachers' perceptions with regard to practice drills and classroom instruction in the use of technology had the most predictive power toward African American male students' academic performance in math.

The sixth question addressed the relationship between the activities teachers use in teaching math objectives and how effective these activities are when teaching math. *What is the relationship between the activities teachers use in teaching mathematics objectives and how effective are these activities in teaching mathematics to African American male students.* A very high positive relationship was found between the activities used by teachers in teaching mathematics objectives and the effectiveness of these activities in teaching mathematics objectives to African American males with regard to presentation software (teacher), multimedia presentation (teacher) computers for drill and practice, spreadsheets, word processing and simulation (computer- based). A high positive relationship was found between the activities used by teachers in teaching mathematics objectives and the effectiveness of these activities in teaching mathematics objectives with regard to internet (student) and presentation software (students). A moderate positive relationship was found between the activities used by teachers in teaching mathematics objectives and the effectiveness of these activities in teaching mathematics with regard to internet (teachers), multimedia presentation (student), and computer for communication.

Results in Teacher Preparedness

One of the most interesting findings of the present study was the level of preparedness of teachers with regard to their use of technology in the classroom. To be sure, teachers were statistically more likely than not prepared to use and implement technology in the classroom. Teachers revealed that they were prepared to use and implement instructional technology to teach African American males.

Teachers revealed that they were prepared to use and implement almost 70% of the technology applications for instruction in their classroom. These findings were consistent with those of Darling-Hammond (1998), Bybee and Loucks-Horsley (2000), Berry (2003), Haycock (2001), and Mayo et al. (2005).

Nevertheless, the present findings were not consistent with the work of the U.S. Department of Education (2004) and Strayhorn (2008) who found African American students are more likely to have the most ineffective teachers. A plausible explanation for the present findings which emphasized the preparedness of teachers to use and implement technology in the classroom might be that these teachers are adequately trained and have a sufficient understanding of the full potential of the level of enrichment that an infusion of technology would bring to the overall learning environment.

Additionally, another explanation for the above findings regarding the preparedness of teachers to use instructional technology in the classroom might be that the teachers surveyed in the present study probably are the ones who feel more comfortable and confident in their abilities to teach technology. Thus, because of their preparedness, this translates into a higher level of use instructional technology in the classroom.

Moreover, Loucks-Horsley (2000) outlined four basic conditions to enhance the preparedness of teachers to use and implement technology use in the classroom. First, there should be a good fit between the knowledge of teachers and their technology skills; secondly, teachers need to understand how to infuse technology in classroom instruction; thirdly, resources and desires to use technology in the classroom must be a necessity; and finally, professional development should be provided to enhance the computer application of teachers.

Another notable finding of the present study dealt with the perceptions held by teachers regarding their level of use of technology in the classroom. Particularly, as a group teachers perceived that they were proficient on 70% of the computer applications used to provide instruction to African American males in the classroom. Also, they perceived that they were at least somewhat proficient in another 20% of the technology applications use in the classroom when teaching African American males. These findings were supported of those of Lovelace (2005), Leonard et al. (2005), Wang et al. (2004), and Mayo et al. (2005). All of the aforementioned researchers in their studies found that teachers had favorable perceptions or attitudes toward the use of technology in the classroom.

However, the present findings were not supported by those of Yildirim (2000), who opined that of all professional groups, teachers had the most unfavorable perceptions' toward the use of technology. Notwithstanding, the findings by Yildirim, a reasonable explanation for the present findings regarding teachers' perceptions toward the use of technology in the classroom might be that regardless of some reluctance on the part of some teachers, a majority of teachers understand the value of technology in crafting new teaching strategies to enhance the overall instructional quality in the classroom.

Results in Teacher Preparedness, Perceptions, and Students' Academic Performance

Another interesting finding of the present study pertained to the relationship between teachers' perceptions and preparedness in the use of instructional technology and the mathematics performance of their African American male students. Specifically, overall, there was a moderate positive relationship between teacher perceptions and preparedness and the mathematics performance of their African American male students. These findings parallel those of Swain and Pearson (2003), Burke and Dunn (2002), Berry (2005), Ferguson (2003), Judge (2005), Halis (2002), Irish (2002), Hitchcock and Noonan (2000), Mooney and Thornton (1999), and Shaughnessy (1998). The above researchers found a positive relationship between the use of technology as an instructional tool and the academic achievement of students in mathematics (Howard, 2001; Wilson-Jones & Caston, 2004).

Wenglinsky (1998) found students who were from both urban and rural areas and were poor and Black, were less likely to be exposed to higher-order uses of computers. Additionally, urban and rural teachers of 8th graders were less likely to have received professional development in technology over a time period of the last five years. The research by Berry (2003), Gay (2002), Banks et al. (2001), Sankofa et al. (2005), and Mooney and Thornton (1999) were done especially on African American students. Thus, an explanation for the current findings might be that teachers' use and preparedness in technology had provided them with instructional tools they can adapt and integrate into any teaching strategy that will fit the learning style and ability of all students, particularly African American male students.

Conclusions and Recommendations

It can be concluded that the level of teachers' preparedness has an influence on the use of instructional technology in the classroom. Teacher's preparedness in technological instruction was related to their African American male students' mathematics achievement. Research has proven time and time again that the more prepared teachers are in the use of instructional technology, the more likely they will utilize their skills with students. Moreover, if the teachers are utilizing varied methods of instructional practices to teach math to diverse learners, including African American males, the more likely their students' math academic achievement will improve, as reported in a study by Middleton and Murray (1999). The level of teachers' preparedness had an influence on the use of instructional technology in the classroom.

It can also be concluded that teachers' preparedness in technological instruction was related to their African American male students' mathematics achievement. Teachers' perceptions in technological instruction were related to their African American male student's achievement in mathematics. Further, the level of teachers' preparedness and their perceptions toward the use of instructional technology in the classroom were reliable predictors of their African American male students meeting the standards in mathematics. This is in alignment with prior research that identified the need for African American males to be assigned to high quality teachers who exhibit characteristics of commitment to students and learning, a strong knowledge base of subject matter and how to teach it, as well as have a responsibility for student learning (Hopkins, 2004).

Lastly, a high or moderate positive relationship existed between the technological activities used by teachers in teaching mathematics objectives to African American males. Wenglinsky (1998) purports to this when he reports when computers are used to perform higher order concepts and when teachers are fully prepared in computer use, for classroom instruction, significant gains can be noted in mathematic achievement.

Further, prior research has found that students who are exposed to classrooms that are technology rich experience positive achievement results in all major subject areas. As revealed in the current study, when teachers utilize instructional technology in their classrooms, African American male students' attitudes toward learning as well as their own self-efficacy improve (Nguyen et al., 2006; Sivin-Kachala, 1998). Students who are exposed to instructional technologies that have clear objectives, will likely experience positive gains on various standardized and national tests (Harel & Papert, 1991).

Based on the findings of the current study, one suggestion for further research is an examination on the effects of demographic factors such as gender, age, and years of experience on the perceptions of teachers regarding the use of instructional technology. Similarly, a perspective from teachers, administrators, and parents regarding perceptions of the degree of use of instructional technology in the classroom are suggested for further research.

Cultural factors that are related to students and what impact they have on using technology to teach students from diverse populations should also be considered for future research. In a research study conducted by Tucker et al. (2005), which explored the effects of a teacher training workshop focusing on efficacy belief, it was reported that there was a significant positive impact on teachers' sense of self-efficacy for working with diverse learners. If teachers are well prepared to utilize instructional practices that appeal to diverse students, their academic achievement level will be positively impacted as proven by the current research.

Although there has been some progress in closing the achievement gap, African American students are still lagging behind in academic performance, namely mathematics by comparison to others. Research should be conducted as to what instructional practices are being utilized when teaching African American students in specific academic areas. A controlled research environment where each group is given particular instructional strategies that include the incorporation of technology is suggested. At the end of the instructional period, compare achievement levels for both groups from the same academic area. Additionally, analyze and report which instructional technology tools were used and how they were used to teach objectives.

Implications

The variable teachers' preparedness and its impact on the use of instructional technology in the classroom suggest that some form of policy intervention needs to be implemented to bridge the gap between teachers' preparedness and the school district's technology standards. Because technology integration is a gradual process (Bybee &

Loucks-Horsley, 2000) this intervention will ensure that the proper course of action is being taken to improve the overall pedagogical process. Only through a positive connection between instruction and learning can all students reach their academic potential.

When preparing teachers to utilize instructional technology, the focus should be on teaching with technology and not teaching technology. The use of technology in the classroom must be challenging and must focus on higher order thinking skills. In doing so, the implementation of instructional technology will have a positive effect on student achievement at all school levels including middle school. Administrators should allow teachers the time and resources to learn and use technology as an instructional tool. This constructivist approach will provide African American male students with authentic learning experiences as well as motivation for learning (Nguyen et al., 2006).

The variable teachers' perceptions and its influence on the use of instructional technology in the classroom suggest that some teachers have apprehension toward technology use. The literature pointed out that teachers' pedagogical perceptions play a vital part in teaching with technology (Leonard et al., 2005). It is from this perspective that there is an apparent need for school districts to develop professional development programs to cultivate the perceptions of teachers toward the use of instructional technology in the classroom.

The relationship between teachers' preparedness and their perceptions regarding the use of technology and the mathematics performance of African American male students suggest that the infusion of technology in the classroom on the part of teachers has had some success on the math performance of these students. It is imperative that all teachers regardless of their students' ethnicity will use instructional technology to promote conceptual knowledge through simulations and applications rather than drill and practice and playing games (Berry, 2003). Technology implementation should be included in curriculum such that it is a seamless component of instruction and evaluation. School districts must give teachers the invaluable resources that they need to achieve professional development on the implementation of instructional technology to teach all students, including African American males (Quinn & Valentine, 2002).

Summary

Many teachers feel poorly prepared to teach students from low-income or ethnic minority backgrounds and convey low expectations for their success. This phenomenon is best addressed by introducing professional development programs that are designed to enhance teachers' efficacy for working with diverse students. Addressing diverse students' learning styles is one of the first steps towards culturally responsive teaching.

There is an urgency to address diverse students' learning styles in order to assure academic success particularly in lieu of the fact that there is an achievement gap in mathematics that exists in America's schools today with respect to African American students. Teacher use of instructional technology to teach mathematics objectives has proven to be a method of classroom instruction that improves math academic achievement of African American males.

If computers are to be utilized in the classroom in a constructivist approach, students will benefit by the potential that exists for development of higher order cognitive skills. It is important to understand that there will be a need for highly trained and qualified teachers in order to practice this computerized constructivist approach in the classroom. Teachers who are trained in technology integration are more likely to use technology more frequently in their lessons than teachers who have not been trained.

This study revealed there is a positive relationship between math performance of students and their teachers' preparedness in the use and implementation of technology in the classroom. Further, there was evidence of a positive relationship between the technological activities that teachers use when teaching math objectives and the effectiveness of these activities. The current study also revealed that the teacher participants were prepared to use and implement almost 70% of the technology applications for instruction in their classroom.

Technology offers an excellent vehicle for adapting instruction to the individual needs and preferences of all students. Administrators should start with defining educational goals and divisions of students' learning utilizing technology. Once those goals are defined, teachers need to be trained with those goals in mind, on how to utilize technology to teach class objectives. This training cannot be a one-time training. All professional development must be interactive, innovative, and ongoing in order to be effective in improving higher-order thinking skills as well as improving academic achievement as measured by standardized tests.

Schools must strive to make educational technology available such that all students can benefit from its infusion. All students, including low-socio economic, minority, special education, as well as students with other disabilities should be given the opportunity to improve their academic achievement. This must be done by empowering teachers through professional development, enforcing standards that include use of instructional technology and allocating funds for proper infrastructure to be built in place to support such technologies.

Once strategies are outlined for the implementation of instructional technology, there should also be plans to evaluate the strategies. In an effort to monitor and ensure students' ongoing success, the impact of the instructional technology component should be measured such that adjustments may or may not be made. This goes back to addressing individual learning styles. In order to ensure students' academic success, we must address learning styles as well as maintain a ssense of culturally responsive pedagogy. We must be willing as educators, to be flexible, make adjustments, and conform to our students' needs in order to ensure overall academic success.

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APPENDIX A

SURVEY

Middle School Students' Mathematics Teacher Survey

An Assessment of Preparation and Perceived Level of

Use of Instructional Technology

The purpose of this survey is to assess your skills in the use of instructional technologies. The information you provide will help identify the professional development areas of technology mediated instructional strategies that are needed to assist teachers in acquiring and utilizing better skills in the classroom that assist students in better Math academic performance.

I. BACKGROUND

Number of Years Teaching Experience ____________________

Course(s) You Teach ___________________________________

Number of Hours Of Instructional Technology Training _____

Grade Level(s) you teach _______________________________

Sex: M F

Ethnicity: Black Hispanic White Asian Native American Other

How many technology classes have you taken during the course of professional development? ______

II. TECHNOLOGY PROFICIENCY

Please respond to each of the following items. Check the circle next to the number of the level that corresponds to your current level of technology use to teach mathematic objectives to African American male students. For example, checking Level 3 indicates that you are proficient in the skills indicated in previous levels as well as the skills in Level 3.

1. Basic Computer Operation

O Level 1 - I do not use a computer

O Level 2 - I can use the computer to run a few specific, pre-loaded programs. It has little effect on either my work or home life. I am somewhat anxious I might damage the machine or its programs.

O Level 3 - I can set up my computer and peripheral devices, load software, print, and use most of the operating system tools like the scrapbook, clock, notepad, find command, and trash can.

O Level 4 - I can run two programs simultaneously, and have several windows open at the same time. I can customize the look and sounds of my computer. I use techniques like ALT-TAB to work with multiple programs. I look for programs and techniques to maximize my operating system.

2. Email Use

O Level 1 - I do not use electronic mail, nor can I identify any uses or features they might have which would benefit the way I learn.

O Level 2 - I send occasional requests for information and messages using email – mostly to friends and family.

O Level 3 - I use email on a regular basis and/or participate in online email discussions via listserves.

O Level 4 - I involve others in using email and listserves to communicate with others regardless of location.

3. Web Browser Operation & Internet

O Level 1 - I do not use the Web, nor can I identify any of its uses or features that would benefit the way I learn.

O Level 2 - I use Web searching software and other Internet resources to locate important sources of information.

O Level 3 - I am able to use Web searching software as well as lists of Internet resources to explore educational resources.

O Level 4 - I can create my own HTML pages and hot-lists of resources.

4. Information Searching

- O Level 1 - I am unlikely to seek information when it is in electronic formats.
- O Level 2 - I can conduct simple searches with the electronic encyclopedia and library software for major topics.
- O Level 3 - I have learned how to use a variety of search strategies on several information programs, including the use of "logical operators" such as "and" and "or" to help target the search and find just the right information in the most efficient manner. I can use search engines like Infoseek, Excite, Lycos, Google, and Web Crawler.
- O Level 4 - I have incorporated logical search strategies with others, showing them the power of such searches via the internet.

5. Presentation Skills

- O Level 1 - After completing a project, I am unlikely to use electronic technologies to save, format, or share my findings.
- O Level 2 - I would feel comfortable presenting my project in a single application program, such as a word processor, a spreadsheet or a publishing program.
- O Level 3 - I am proficient at incorporating and sharing my projects using multimedia presentation software (e.g., PowerPoint, Hyperstudio) which combine elements from a number of applications (e.g., Netscape, graphics, word processor, database).
- O Level 4 - I can use of a variety of applications to present projects.

6. Word Processing

- O Level 1 - I do not use a word processor, nor can I identify any uses or features it might have which would benefit the way I learn.
- O Level 2 - I occasionally use the word processor for simple documents. I generally find it easier to handwrite or type most written work I do.
- O Level 3 - I use the word processor for nearly all my written work. I can edit, spell check, and change the format of a document. I feel my work looks professional.
- O Level 4 - I have taught others to use a word processor and often help others with formatting problems.

7. Spreadsheet

O Level 1 - I do not use a spreadsheet, nor can I identify any uses or features it might have which would benefit the way I learn.

O Level 2 - I understand the use of a spreadsheet and can navigate within one. I can create a simple spreadsheet that adds a column of numbers.

O Level 3 - I can use a spreadsheet for several applications. These spreadsheets use labels, formulas and cell references. I can change the format of the spreadsheets by changing column widths and text style. I can use the spreadsheet to make a simple graph or chart.

O Level 4 - I use the spreadsheet to improve my own data keeping and analysis skills. I also use the spreadsheet to explore questions and the power of mathematical relationships.

8. Database

O Level 1 - I do not use a database, nor can I identify any uses for features it might have which would benefit the way I learn.

O Level 2 - I understand how to use a database and can locate information within one which has been pre-made. I can add or delete data in the database.

O Level 3 - I use databases to collect and analyze data. I can create a database from scratch, including defining fields and creating layouts in order to support inquiry. I can sort and print the information in layouts which are useful to me.

O Level 4 - I can use formulas with my database to create summations of numerical data. I use the database to gather and analyze data to explore questions.

9. Graphics Use

O Level 1 - I do not use graphics in my word processing or presentations, nor can I identify any uses or features they might have which would benefit the way I learn.

O Level 2 - I can open, create, and place pictures into documents using painting and drawing programs.

O Level 3 - I can open, create, modify, and place graphics into documents in order to help clarify projects.

O Level 4 - I can manipulate and interpret graphics using image processing software (such as CAD, GIS or Photoshop) for the purpose of design or analysis.

10. Ethical Use Understanding

O Level 1 - I am not aware of any ethical issues surrounding computer use.

O Level 2 - I know that some copyright restrictions apply to computer software.

O Level 3 - I clearly understand the difference between freeware, shareware, and commercial software and the fees involved in the use of each.

O Level 4 - I am aware of other ethical issues involving technology use including medical and equitable access ones. I have a personal philosophy I can articulate regarding the use of technology.

III. TECHNOLOGY-MEDIATED INSTRUCTIONAL STRATEGIES

Which of the following activities did you implement while teaching mathematic objectives and how effective do you think the activities were on your students' l learning? First circle the number next to each strategy listed that indicates the extent to which you used it to teach the math objectives. Then circle the number corresponding to your opinion of the effectiveness of the strategy for your students' learning. **If you are not familiar with a technology, please check the box in the first column "Don't know what this is"** and do not mark anything in the "How Often?" and "How Effective?" boxes.

		How Often?				How effective was it?			
	Don't Know What This Is	*Never*	*Sometimes*	*Often*	*Almost Always*	*Ineffective*	*Somewhat Effective*	*Effective*	*Very Effective*
1. internet for educational purposes (by teacher)	□	1	2	3	4	1	2	3	4
2. internet for educational purposes (by students)	□	1	2	3	4	1	2	3	4
3. presentation software (e.g. Power Point) by teacher	□	1	2	3	4	1	2	3	4
4. presentation software (e.g. Power Point) by students	□	1	2	3	4	1	2	3	4
5. multimedia presentations (e.g. DVDs, VCRs, slide projectors) by teacher	□	1	2	3	4	1	2	3	4
6. multimedia presentations (e.g. DVDs, VCRs, slide projectors) by student	□	1	2	3	4	1	2	3	4
7. computers for communication (asynchronous)*	□	1	2	3	4	1	2	3	4
8. computers for communication (synchronous)**	□	1	2	3	4	1	2	3	4
9. computers for drill and practice	□	1	2	3	4	1	2	3	4
10. spreadsheets (eg. ExCEL, Lotus)	□	1	2	3	4	1	2	3	4
11. word processing	□	1	2	3	4	1	2	3	4
12. simulation (computer-based)	□	1	2	3	4	1	2	3	4

*refers to communication such as email that does not require both parties to be online at the same time
**refers to communication such as chat rooms that is based on simultaneous interactions.

IV. TECHNOLOGY PERCEPTIONS

Please respond to each of the following items. Check the circle next to the number of the level that corresponds to your perceived level of preparedness to implement technology skills when teaching mathematic objectives to African American male students.

1. Computer applications
   o I am not at all prepared to assign work using computer applications such as word processing or spreadsheet.
   o I am somewhat prepared to assign work using computer applications such as word processing or spreadsheet.
   o I am well prepared to assign work using computer applications such as word processing or spreadsheet.
   o I am very well prepared to assign work using computer applications such as word processing or spreadsheet.

2. Internet correspondence
   o I am not at all prepared to assign work that involves corresponding with experts, authors, students, etc via email or Internet.
   o I am somewhat prepared to assign work that involves corresponding with experts, authors, students, etc. via email or Internet.
   o I am well prepared to assign work that involves corresponding with experts, authors, students, etc. via email or Internet.
   o I am very well prepared to assign work that involves corresponding with experts, authors, students, etc. via email or Internet.

3. Presentation skills
   o I am not at all prepared to present materials graphically (PowerPoint, Hyperstudio, VCRs, DVDs, etc.)
   o I am somewhat prepared to present materials graphically (PowerPoint, Hyperstudio, VCRs, DVDs, etc.)
   o I am well prepared to present materials graphically (PowerPoint, Hyperstudio, VCRs, DVDs, etc.)
   o I am very well prepared to present materials graphically (PowerPoint, Hyperstudio, VCRs, DVDs, etc.)

4. Information searching
   o I am not at all prepared to assign work that incorporates search strategies using the Internet.
   o I am somewhat prepared to assign work that incorporates search strategies using the Internet.
   o I am well prepared to assign work that incorporates search strategies using the Internet.
   o I am very well prepared to assign work that incorporates search strategies using the Internet.

5. Practice drills
   o I am not at all prepared to assign computer work for drill and practice.
   o I am somewhat prepared to assign computer work for drill and practice.
   o I am well prepared to assign computer work for drill and practice.
   o I am very well prepared to assign computer work for drill and practice.

6. Classroom instruction
   o I am not at all prepared to use computers and the Internet for classroom instruction.
   o I am somewhat prepared to use computers and the Internet for classroom instruction.
   o I am well prepared to use computers and the Internet for classroom instruction.
   o I am very well prepared to use computers and the Internet for classroom instruction.

V. MATH TAKS PERFORMANCE OF STUDENTS

Please respond to the following questions concerning your African American male students' 2009 Math TAKS performance by placing your answer in the blank space next to the question.

Please note that questions 1-4 pertain to 6th grade Mathematics teachers. Questions 5-8 pertain to 7th grade Mathematics teachers. Questions 9-10 pertain to 8th grade teachers.

6th GRADE

1. How many 6th grade African American Male Students did you teach Mathematics to in the 2008-2009 school year? _______
2. How many of your 6th grade African American Male Students took the regular Math TAKS test in 2009? _____
3. How many of your 6th grade African American Male Students met the standards on the regular Math TAKS test in 2009?______
4. How many of your 6th grade African American Male Students received commended performance on the regular Math TAKS test in 2009? _______

7th GRADE

5. How many 7th grade African American Male Students did you teach Mathematics to in the 2008-2009 school year? _______
6. How many of your 7th grade African American Male Students took the regular Math TAKS test in 2009? _____
7. How many of your 7th grade African American Male Students met the standards on the regular Math TAKS test in 2009?______
8. How many of your 7th grade African American Male Students received commended performance on the regular Math TAKS test in 2009? _______

8th GRADE

9. How many 8th grade African American Male Students did you teach Mathematics to in the 2008-2009 school year? _______
10. How many of your 8th grade African American Male Students took the regular Math TAKS test in 2009? _____
11. How many of your 8th grade African American Male Students met standards on the regular Math TAKS test in 2009?______
12. How many of your 8th grade African American Male Students received commended performance on the regular Math TAKS test 2009? ______

APPENDIX B

PARTICIPANT LETTER

2903 Benne Court
Houston, Texas

January 6, 2008

Project: Dissertation Research

Topic: *The Relationship of Teachers' Preparation and Perceived Level of Use of Technology on Math Academic Achievement of Middle School African American Males*

Researcher: Sherrie D. Mason, Doctoral Student, Texas A&M University

Participant Institution:

To Whom it May Concern:

I am conducting a study under the supervision of Dr. Norvella Carter at Texas A&M University. She may be contacted at 979-862-3802. The requested participants in the study will be Middle School level Math teachers in the Aldine Independent school district and the Math TAKS scores of their respective male African American Math students.

The purpose of this study is to determine math teachers' the level of use of technology for instructional purposes. The study will also investigate whether the level of use of technology has an impact on the Math academic achievement for middle school African American students.

Upon obtaining permission from the district to complete the study, the surveys will be taken to each middle school along with an information sheet to 6 middle school principle in an effort to explain the study and get permission to include their campus in the study.

With the permission of the principal at each of the targeted schools, I will place in each Math teachers' box, a copy of the survey, the information sheet, and the self adhesive envelope for returning the survey.

The participants will be instructed to place the completed surveys inside of the envelopes and to then give them to the appointed administrator who would then store the surveys in a locked drawer until all participants' envelopes are collected.

The survey will include a response section for (1) teacher demographics, (2) teacher perceived level of preparedness for use of instructional technology, (3) teacher technology proficiency, (4) teacher level of use of technology-mediated instructional strategies and (5) an assessment of Math TAKS performance from African American Male students of teacher participants.

Once the surveys have been completed by the designated time, I will retrieve them from each of the respective principals. The surveys will be placed in a locked drawer when not in use by me for the purpose of research. Please note that confidentiality of teachers and student scores will be maintained via a number coding system. Hence, no names will be used in the study and there will be no way for the reader to connect the students' scores to the teacher. I, the primary researcher, will have access to this information.

The research will be a quantitative descriptive design. I will be compiling, computing analyzing and interpreting statistical data in order determine the findings for the study.

Your support and approval is needed and will be abundantly appreciated. Please sign the letter in the designated space if this proposal meets your approval. You may keep a copy for your records. Thank you in advance for your consideration.

Sincerely,

Sherrie D. Mason

PERMISSION GRANTED FOR THE USE REQUESTED ABOVE:

Institutional Representative: ___________________________ Date: _______________

APPENDIX C

INFORMATION SHEET

INFORMATION SHEET

The Relationship of Teachers' Preparedness and Perceived Level of Use of Technology on Math Academic Achievement of Middle School African American Males

Introduction

The purpose of this form is to provide you (as a prospective research study participant) information that may affect your decision as to whether or not to participate in this research.

You have been asked to participate in a research study that involves middle school teacher's use of instructional technology and its effects, if any on the TAKS math scores of students. The purpose of this study is to investigate teacher perceptions of their level of use of instructional technology and how that level of use of technology impacts' their students' academic performance in Mathematics. You were selected to be a possible participant because you are a middle school math teacher in an urban school district.

What will I be asked to do?

If you agree to participate in this study, you will be asked to complete the survey that contains questions concerning demographical information. The survey will also include questions concerning teacher perceptions of their proficiency to implement technology skills. Additionally, the survey will include questions that measure teachers' use of technology-mediated instructional strategies. Further, the study will include questions concerning the teachers' African American male student's performance on the TAKS test. This study will take approximately 15 minutes to complete. You will be asked to complete the survey on paper and return it to the researcher in the provided sealable envelope once completed.

What are the risks involved in this study?

The risks associated with this study are minimal, and are not greater than risks ordinarily encountered in daily life.

What are the possible benefits of this study?

You will receive no direct benefit from participating in this study; however, you will be providing valuable information that may result in teachers being better trained to serve all students' needs where they may be academically successful. This would possibly include better access to technology and training on how to use it for classroom instructional purposes. Students will benefit academically from teachers' professional development which addresses deficits and enhancements of technology mediated instruction.

Do I have to participate?

No. Your participation is voluntary. You may decide not to participate or to withdraw at any time without your current or future relations with Texas A&M University.

Who will know about my participation in this research study?

This study is confidential and the records of this study will be kept private. No identifiers linking you to this study will be included in any sort of report that might be published. Research records will be stored securely and only Sherrie D. Mason, the researcher, along with the committee chairperson, Dr. Norvella Carter will have access to the records.

Who do I contact with questions about the research?

If you have questions regarding this study, you may contact Sherrie D. Mason at sherrie-dee-mason@neo.tamu.edu.

Who do I contact about my rights as a research participant?

This research study has been reviewed by the Human Subjects' Protection Program and/or the Institutional Review Board at Texas A&M University. For research-related problems or questions regarding your rights as a research participant, you can contact these offices at (979)458-4067 or irb@tamu.edu.

Participation

Please be sure you have read the above information, asked questions and received answers to your satisfaction. If you would like to be in the study, please complete the survey and seal it inside of the provided envelope. Please complete within one week of receiving the survey.

VITA

Sherrie Dee Mason
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EDUCATION

Doctor of Philosophy, 2011
Curriculum and Instruction
Texas A&M University, College Station, Texas

Master of Education, 2007
Educational Administration
Sam Houston State University, Huntsville, Texas

Master of Arts, 1998
Counseling
Prairie View A&M University, Prairie View, Texas

Bachelor of Business Administration, 1994
General Business
Texas Southern University, Houston, Texas

CERTIFICATIONS

School Principal (Pre K thru 12); Texas
School Counselor (Pre K thru 12); Texas
Vocational Office Education (Secondary Teacher (6 thru 12)); Texas

EMPLOYMENT HISTORY

2008-Present	Spring Independent School District, Spring, Texas Career and Technical Education Specialist/Counselor
1998-2008	Aldine Independent School District, Houston, Texas Career & Technical Education Teacher
1995-1998	American General Life Insurance/VALIC, Houston, Texas Customer Service Representative

This dissertation was typed and edited by Marilyn M. Oliva at Action Ink, Inc.